

# ***Psychological and Contextual Influences on Travel Mode Choice for Commuting***

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# Abstract

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Travel behaviour – especially car use – is of concern because it contributes to environmental problems such as climate change. Focusing on commuting, this thesis aimed to explain people's travel mode decisions and what might motivate drivers to switch modes. The literature shows that – as in the wider field of environmentally-significant behaviour – Schwartz's norm-activation theory (NAT) and Ajzen's theory of planned behaviour (TPB) are predominant in travel psychology. Research undertaken for this thesis was based on these theories.

Study 1 used logistic regression ( $n = 312$ ) to test NAT and the TPB's ability to explain drivers' intentions to maintain or reduce their car use for commuting to De Montfort University (DMU). A model using variables from both theories was also tested, as was a model that added contextual variables to these psychological constructs. The model including contextual variables had the greatest predictive power (shown by  $R^2$  values). There were interactions between several predictor variables. Most notably, the influence of altruistic (pro-environmental) motives on intentions was moderated by perceived control over commuting mode choice and by contextual factors including bicycle ownership, carriage of passengers and journey time.

In study 2, 24 semi-structured interviews were undertaken with commuters to DMU. Using discourse analytic techniques, the prevalent stances on car use and use of other modes for travel to work were identified. Many echoed NAT and TPB constructs (e.g. moral motives, perceived control over modal choice), underlining these theories' applicability to commuting. However, other stances were also evident, most notably affective motives and habits as reasons for commuting mode decisions. People drew on various combinations of these discourses to explain their commuting behaviour.

The thesis proposes a new model of commuting mode choice and suggests guidelines for interventions designed to encourage drivers to use alternative modes. However, it is stressed that reliance on attitude-behaviour research alone may ignore wider socio-cultural influences on travel behaviour. Suggestions are made regarding theoretical perspectives and methods that may help in understanding these forces and a case is made for mixed-method research as the way ahead for travel psychology.





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# ***Abbreviations and acronyms***

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Several abbreviations and acronyms are used in this thesis. Although each is spelled out on its first usage in a chapter, they are collected here for ease of reference.

AC	awareness of consequences (construct from NAT)
AIC	Akaike information criterion
AR	ascription of responsibility (construct from NAT)
ATT	attitude towards a behaviour (construct from the TPB)
BBC	British Broadcasting Corporation
BI	behavioural intention (construct from the TPB)
CFC	consideration of future consequences (Joireman, Van Lange and Van Vugt, 2004)
CO <sub>2</sub>	carbon dioxide
DMU	De Montfort University
ESB	environmentally-significant behaviour
g/km	grams per kilometre
GTG	Green Travel Group
HEV	hybrid-electric vehicle
IPT	identity process theory (Breakwell, 1993)
MEA	Millennium Ecosystem Assessment
NAT	norm-activation theory (Schwartz, 1977)
NEP	new environmental paradigm (Dunlap and Van Liere, 1978) or new ecological paradigm (Dunlap, Van Liere, Mertig, Catton Jr. and Howell, 2000)
NHS	National Health Service
PBC	perceived behavioural control (construct from the TPB)
PCA	principal components analysis
PN	personal norm (construct from NAT)
ppm	parts per million
PSE	perceived self-efficacy
RD	responsibility denial (construct from NAT)
SE	standard error
SEU	subjective expected utility

SIC	Schwarz information criterion
SN	subjective norm (construct from the TPB)
SRT	social representations theory (Moscovici, 2000)
TIB	theory of interpersonal behaviour (Triandis, 1977)
TPB	theory of planned behaviour (Ajzen, 1991; 1991a)
TRA	theory of reasoned action (Ajzen and Fishbein, 1980)
UK	United Kingdom
US	United States (of America)
VC	volitional control

# Chapter 1

## Research context

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### 1.1 Climate change: 'The most serious global environmental threat'

The Millennium Ecosystem Assessment (MEA) was launched by the United Nations in 2001 and reported in 2005. Billed as the “most comprehensive survey ever into the state of the planet” (Amos, 2005), it argues that overuse of resources is “already causing significant harm... and unless addressed will substantially diminish the long-term benefits obtained from ecosystems” (MEA, 2005, 5).

The MEA identifies many anthropogenic environmental problems, including “disease emergence, abrupt alterations in water quality, the creation of “dead zones” in coastal waters, the collapse of fisheries, and shifts in regional climate” (Ibid., 6). The prognosis based on this global study is alarming.

Recent decades have seen increased awareness of humankind's negative impacts on the non-human environment and such concerns have risen up political agendas in the UK and elsewhere. Anthropogenic climate change, in particular, has been identified as “the most serious global environmental threat” (DEFRA, 2005, 3) and “our most pressing global environmental issue” (Dunn and Flavin, 2002, 49). The phenomenon – manifest in rising average global temperature, but regional warming and cooling – is widely accepted by climatologists and is blamed for drought, flooding, habitat loss and consequent socio-economic impacts (IPCC, 2001). Thus, whether one values the non-human environment for its own sake (e.g. Lee, Holland and McNeill, 2000) or is concerned about the consequences of ecosystem degradation for humans, there are imperatives for environmental protection.

Climate change is caused by several factors. According to the Centre for International Climate and Environmental Research, these include changes in the reflectivity of Earth's surface, in solar radiation, in the planet's orbit and in atmospheric composition (Alfsen, Fuglestvedt, Seip and Skodavin, 1999). It is this last variable on which human activity has had a profound effect in a short (geological) time. Concentrations of carbon dioxide (CO<sub>2</sub>) – “the most important gas for the man-made enhancement” of climate



change (Ibid., 15) – rose from 280 parts per million (ppm) in 1750 to 374 ppm in 2000 (IPCC, 2002). The main reason for this increase was fossil fuel combustion (Ibid.).

## **1.2 The problem of personal transport**

Fossil fuels have been the main energy source in Western societies since the industrial revolution (Von Weizsäcker, 1994) and their use is increasing rapidly in developing countries. For example, between 1993 and 2002 fossil fuel consumption in India and China rose by 46.2% and 31.6%, respectively (BP, 2004). Due to concerns over climate change, policies are being implemented to shift energy generation to renewable sources and to increase the efficiency of energy use (e.g. DTI, 2003). Although atmospheric CO<sub>2</sub> levels are expected to rise well into the 21<sup>st</sup> Century (IPCC, 2002), these policies have had some effect. UK CO<sub>2</sub> emissions from the industrial, domestic and service sectors fell between 1990 and 2000; reducing national CO<sub>2</sub> emissions by 8% (Foley and Fergusson, 2003). However, CO<sub>2</sub> emissions from road transport rose by 3.6% and transport “is the only sector where emissions are expected to be higher in 2020 than in 1990” (Bristow, Pridmore, Tight, May, Berkhout and Harris, 2004, 3).

There are several reasons for this trend; not least the increasing number of cars on UK roads. Between 1975 and 2001 the number of registered cars doubled to 24 million (Exley and Christie, 2002). By 2001 cars accounted for 85% of passenger miles, trains for 7%, buses and coaches for 6% and motorbikes, bicycles and walking just 2% (Ibid.). This car dependence can be partly attributed to contextual factors such as rising incomes (Ibid.), poor public transport (Ibid.), growing numbers of women in work (Root and Schintler, 1999) and planning strategies that have increased distances between home, work and leisure destinations (Rodríguez and Joo, 2004). Often because of such factors, driving is perceived as the most convenient, flexible and reliable way to travel (e.g. Anable and Gatersleben, 2005).

Besides perceptions of utility, other social-psychological forces are at play. As journalist and novelist Tom Wolfe said of 1960s car culture, “Cars mean more to these kids than architecture did in Europe’s great formal century, say, 1750 to 1850. They are freedom, style, sex, power, motion” (Wolfe, 1969, quoted by Bayley, 2003, 11). The academic literature also suggests that driving confers non-instrumental benefits such as status, personal control (e.g. Ellaway, Macintyre, Hiscock and Kearns, 2003) and fun (e.g.

Steg and Uneken, 2002). Moreover, car manufacturers exploit and perpetuate these perceptions in their advertising (Steg, Vlek and Slotegraaf, 2001).

For these reasons, “even the most energy efficient cars will not deliver carbon emission reductions on the scale likely to be needed to reduce the climate change impacts of road transport over the longer term” (Foley, 2003, 1). While European manufacturers should meet their voluntary target of reducing average CO<sub>2</sub> emissions from new cars to 140 g/km by 2008 (Foley & Fergusson, 2003), deep cuts in transport emissions will require new technologies if car use continues at present levels or rises further. It has been suggested that hybrid-electric vehicles (HEVs), which use a battery-powered motor and an engine that operates on fossil fuel, are at best an interim step (Reuyl, 2005). Although HEVs produce less CO<sub>2</sub> per mile than fossil fuel-only vehicles, the difference is too small (Foley, 2003) to contribute significantly to the emissions reductions called for in the long term (e.g. RCEP, 2002). It has, therefore, been said that “hydrogen currently holds out the most promise for achieving radical reductions in carbon emissions” from transport (Foley, 2003, 11). However, problems with infrastructure, funding and public acceptance mean that despite the existence of prototypes (*Figure 1.1*) significant shifts in this direction remain decades away (Ibid.; Foley & Fergusson, 2003). Moreover, although HEVs and hydrogen reduce per car emissions, they will not solve problems caused by congestion and the inaccessibility of services to people without cars (Nilsson and Küller, 2000).



Figure 1.1 BMW's 745h hydrogen-powered car, London Clean Energy Expo, May 2005

### **1.3 Psychology's contribution to the solution**

The above account suggests a need for behavioural change (people switching from cars to modes that cause less pollution and congestion and/or avoiding some journeys altogether) as well as technological change. Thus, the branch of environmental psychology “that looks at the roots of environmental degradation and the connections between... attitudes and pro-environmental behaviors” (Kollmuss and Agyeman, 2002, 240) has much to offer. We cannot hope to promote actions that benefit the environment without understanding what motivates and constrains them.

Accordingly, there has been much academic interest in ‘environmentally-significant behaviour’ (ESB) in recent years. ESB can be defined by “the extent to which it changes the availability of materials or energy from the environment or alters the structure and dynamics of ecosystems or the biosphere” (Stern, 2000, 408). Given the resource requirements and emissions associated with fossil-fuelled travel modes, travel behaviour is clearly environmentally significant. Thus, within the wider sphere of ESB, there is a burgeoning stream of travel research. The present thesis contributes to this field and particularly to the set of studies examining influences on travel mode choices (e.g. Bamberg and Schmidt, 2003; Nordlund and Garvill, 2003). A common premise of such studies is that reducing car use can help to mitigate anthropogenic climate change. It may also improve local air quality and reduce congestion, noise and accidents (Attali and Wilhite, 2001). Moreover, if people switch to modes like walking and cycling, there may be improvements in public health and associated benefits of reduced healthcare demand and increased economic productivity (DfT, 2004).

### **1.4 Commuting**

Many studies of travel mode choice specifically examine commuting (e.g. Bamberg & Schmidt, 2003; Klöckner and Matthies, 2004). Commuter trips may offer significant scope for emissions reductions. In 2002, 71.2% of UK journeys to work were made by car (ONS, 2002) and the average distance was 8.5 miles in 2003 (DfT, 2003). Many people facing shorter commutes might realistically use non-motorised modes. Even those commuting further may be able to use public transport, especially in urban areas. At average occupation levels, CO<sub>2</sub> emissions per passenger mile by train and bus can be 50% lower than by car (DfT, 2004), so widespread switching from driving to these modes could contribute much to environmental protection. Moreover, commuting trips are frequent, regular and often habitual (Klöckner & Matthies, 2004). If environmentally-



benign commuting habits can be formed, they might influence 10 journeys each week for a full-time UK worker. As such a person commutes, on average, over 4,000 miles per year (DfT, 2003) the potential for reduced emissions is clear.

Commuting is a special case of travel behaviour because trips are especially constrained. They must be made at particular times, lateness may be penalised, the destination is fixed, people may have to arrive dressed in certain ways or carry certain items (Nankervis, 1999) and the journey is often very routine. In accordance with the view that ESB is heterogeneous and that different behaviours have different determinants (e.g. Poortinga, Steg and Vlek, 2004; Stern 2000), commuting should be studied as distinct from other travel behaviours and this is the focus of the thesis.

### 1.5 The research setting

Participants in the studies presented here were staff and students at De Montfort University (DMU). DMU is a former polytechnic and gained university status in 1992. It markets itself as “a leading university for professional, creative and vocational education, underpinned by research excellence” and claims to widen “participation to provide opportunity to all those with the ability to benefit from University education” (DMU, 2005a). This is illustrated by provision of foundation degrees (two years as opposed to traditional three-year undergraduate courses) and advertising aimed at prospective students from local areas who may not wish to relocate (*Figure 1.2*).



*Figure 1.2 DMU student recruitment advert, Leicester, May 2005*

During study 1 (April 2003) DMU had 18,515 attending students (14,946 undergraduates and 3,569 postgraduates) and 3,380 academic and non-academic staff; a population of 21,895. They were spread across seven campuses; three in Leicester, three in Bedford and one in Milton Keynes, all in England's midlands region. By the time of study 2 (April 2004), DMU had reorganised its campuses and four remained; two in Leicester and two in Bedford. Staff and students who had been based elsewhere were relocated to campuses still in operation.

As part of DMU's ongoing regeneration of the Leicester City campus, it is required by the City Council to implement a Green Travel Plan that promotes sustainable transport in Leicester. To oversee this plan, DMU has formed a Green Travel Group, consisting of representatives from each faculty and non-academic department. The Plan came into force in 2003 and has subsequently been revised annually, but has retained "the principle objective of altering the current modal split of travel to the University in favour of more sustainable modes of transport than the private car" (DMU, 2005).

The survey used in study 1 was undertaken with DMU's Green Travel Group, which was at the time developing its first Plan. The survey was originally intended to gather baseline data on staff and student travel, but the opportunity arose to include attitudinal items and items tapping perceptions of context relating to commuting (e.g. access to public transport) alongside the Green Travel Group's more factual questions. This enabled collection of a large amount of data, but imposed some restrictions in terms of what could be asked and how. These are detailed in Chapter 5.

## **1.6 Research aims**

Broadly, the research presented here aimed to explain why people commute by particular travel modes, what may motivate drivers to switch to non-car modes and what may prevent them from doing so. More specifically, it aimed to propose particular psychological and contextual influences on commuting mode choice by applying established psychological theories and by developing theory based on participants' accounts of their behaviour. These outputs are of practical policy relevance.

The thesis also had theoretical and methodological aims. Firstly, it sought to test the ability of two common theories in ESB research – Schwartz's (1977) norm-activation theory (NAT) and Ajzen's (1991; 1991a) theory of planned behaviour (TPB) – to explain

drivers' intentions to reduce or maintain their car use for commuting in a particular setting. Secondly, it sought to identify variables that might be added to these theories to improve their explanation of travel mode intentions. Thirdly, it sought to place travel behaviour in a wider context and to suggest how theories from other areas of psychology (e.g. Breakwell, 1993) could contribute to the domain. Finally, it sought to approach the question of why people use particular modes for commuting in two complementary and, as argued in Chapter 2, consistent ways; an attitude-behaviour perspective in study 1 and a discourse-analytic perspective in study 2.

## **1.7 Thesis structure**

The thesis has eight chapters. Those that follow this introduction are outlined below.

- **Chapter 2. *Epistemology***

Sets out the epistemological position underpinning the research, explaining the relationship between findings from the studies presented in Chapters 5 and 6.

- **Chapter 3. *Literature review 1: influences on travel mode choice and acceptance and effectiveness of car-use reduction measures***

Presents a review of research on travel psychology and behaviour, describing traditions and trends in the field, examining empirical work and identifying influences on modal choice from previous studies.

- **Chapter 4. *Literature review 2: norm-activation and theory of planned behaviour research on environmentally-significant behaviour***

Focuses on the two theories underpinning the research, explaining the rationale for their use, examining their application in ESB studies and drawing conclusions on the current state of knowledge.

- **Chapter 5. *Study 1: a quantitative study of commuters' car use intentions***

Presents a questionnaire study which used logistic regression ( $n = 312$ ) to examine psychological and contextual influences on drivers' intentions to reduce or maintain their car use for commuting.

- **Chapter 6. Study 2: a qualitative study of travel mode choice for commuting**  
Presents a study using semi-structured interviews ( $n = 24$ ) and discourse analytic techniques to identify and critically analyse commuters' positions on travel to work.

- **Chapter 7. General discussion**

Discusses the findings presented in Chapters 5 and 6 in light of other travel research, other research using NAT and the TPB and theories from other areas of psychology and social science.

- **Chapter 8. Conclusions**

Presents a summary of theoretical and policy-relevant conclusions.

Following these chapters, there is a list of references and a set of appendices containing questionnaires, interview schedules and data coding schemes.

# Chapter 2

## Epistemology

---

### 2.1 Assumptions (not always) made explicit

epistemology *n.* The theory of knowledge, especially the enquiry into what is to count as knowledge, the validity of knowledge, what distinguishes mere belief from knowledge, what kinds of things are knowable, and whether anything can be known for certain

(*Oxford Dictionary of Psychology*, Colman, 2001, 249).

At the outset of an investigation, it is useful to state its assumptions. What information will it provide and what claims are made of this information? Such statements are rare in quantitative environmental psychology research. For example, none of the 24 quantitative studies reviewed in Chapter 4 declares an epistemological position. They are all in the attitude-behaviour tradition, which assumes the existence of mental states (or 'attitudes') that are "long-lived and... relate to behaviour in a systematic manner" (Breakwell, 1993, 209). Perhaps because this tradition stretches back to the early 20<sup>th</sup> Century (Hogg and Vaughan, 2002), the assumption that behaviour is directed by relatively stable, discoverable attitudes is rarely stated today. This is taken as read, reflecting the popular view that "science is derived from the facts" (Chalmers, 1999, 1). 'Facts' are assumed to exist 'out there', waiting to be found. This is taken to apply as much to human behaviour and its determinants as to, say, planetary motion.

Possibly because they often reject this popular view, qualitative researchers tend to be more explicit about their epistemological positions. Some studies reviewed in Chapter 3, for example, are outside the attitude-behaviour tradition. Hagman (2003) describes interviews as constructions, assuming that participants' words cannot be "taken as standing for states of affairs as they really are" (Burningham, 1995, 106). Like other constructivists (e.g. Bickerstaff and Walker, 2002; Potter, 1996; 1998), he argues that one person (researcher) cannot access another's (participant) "inner reality" (Haggett and Smith, 2004, 3); their attitudes, beliefs and so on. All that researchers can know is what participants say and from this information it is possible to identify 'discourses'; "different perspectives on the world" (Fairclough, 2003, 124). But to claim that these



actually reveal speakers' mental states is regarded as unjustifiable. To the extent that perspectives are widely adopted, they are *social* constructions, articulating shared interpretations of the social environment (Berger and Luckmann, 1966). This adds a social dimension to the more individualist view of constructivism as "a doctrine according to which perceptions, memories, and other complex mental structures are actively assembled or built by the mind, rather than being passively acquired" (Colman, 2001, 162).

## **2.2 Attitudes as a social-scientific device**

It has been said that attitude-behaviour researchers and constructivists accept opposing "foundational ontologies", so neither group can ever convince the other of its case (Gergen, 1998, 150). The former assume stable, discoverable, mental states (e.g. Ajzen, 1991) and the latter reject this position (e.g. Potter, 1998). But this debate need not be seen as a dichotomy. There is a continuum between the extremes and this thesis takes the middle ground in its two empirical studies. Study 1 (Chapter 5) used statistics to analyse quantitative data, while study 2 (Chapter 6) took a discursive approach to qualitative data.

How are these perspectives and methods combined coherently? The key is a reassessment of attitude-behaviour assumptions. It is important to realise that no method of data collection gives direct access to people's mental states. We can only ever know what people say, whether in answer to interview questions or survey items. The view that data are not necessarily "windows on what people really think" (Haggett & Smith, 2004, 3) applies in quantitative as well as qualitative studies (Willig, 2001). And, logically, if we cannot reliably detect attitudes, we cannot be *sure* of their existence. The position taken here is that attitudes are a useful device as opposed to a certain reality. The notion of an attitude is itself a 'construct' (see Chapter 4, section 4.2) employed by social scientists because it captures something intangible (some aspect of inaccessible 'inner reality') that – as Breakwell (1993) says – seems to systematically relate to behaviour. While the relationship is imperfect (e.g. Huguenin, 2005), there is plentiful evidence of *some* relationship (see, for example, the studies reviewed in Chapter 4). What we term 'attitudes' seem to be associated, to an extent, with how people behave. It is, therefore, useful to measure attitudes and their relation to behaviour despite the inherent uncertainty.

Furthermore, it is accepted that Breakwell's (1993) "long-lived" attitudes are not immutable. They may change with new information or to reduce cognitive dissonance (Festinger, 1962). They also originate at some point, which may happen in an interview when somebody considers something about which they have not previously thought. At such times, people actively construct positions using language; selecting words "from available cultural themes and concepts, and by their arrangement, making positive claims to a certain version of the world" (Antaki, 1994, 7).

### **2.3 Attitudes and discourses in this thesis**

What does the attitudes-as-a-device position mean for this thesis? Study 1 used quantitative methods which were developed on the assumption of persistent, discoverable mental states. Data were collected using survey items and analysed using statistics. These methods are vulnerable to measurement error. For example, people may provide socially-desirable answers and/or interpret the same response options in different ways. Nonetheless, study 1 rested on the premise that it is useful to ask people about their 'inner realities' and to try to identify influences on some outcome variable; in this instance, car use intentions. If we do not try to discover how people's psychology influences their behaviour, there seems little to guide efforts at behaviour change. It is necessary to study broader social processes as well (see Chapter 7, section 7.3), but these two levels of understanding are each necessary and only together sufficient to explain – insofar as they can be explained – people's actions.

Study 2 identified shared perspectives on car use and use of other transport modes from interview accounts of commuting. In other words, it took a social-constructivist approach. Many users of the discourse-analytic techniques employed in study 2 argue that researchers can discern only fleeting articulations of socially-constructed realities (e.g. Haggett & Smith, 2004; Potter, 1996; 1998). The present position differs in asserting that evidence of people's current (and possibly fleeting) perspectives *may* illuminate more persistent mental features (Fairclough, 2003).

Fairclough (Ibid., 124) argues that discourses represent "the material world, the 'mental world' of thoughts, feelings, beliefs and so forth, and the social world". Accepting that discourses are perspectives on things and attitudes are "more-or-less consistent pattern[s] of affective, cognitive, and conative or behavioural responses" towards them (Colman, 2001, 63), it seems plausible that the discourses people invoke may

articulate their attitudes; at least those held at the time of data collection. Contrary to the oft-unspoken assumptions of the attitude-behaviour tradition, it is argued here that these attitudinal 'snapshots' are really all that we have available to us as social scientists.

Discourses differ in generality: "how much of the world they include" (Fairclough, 2003, 124). For example, representation of "people as primarily rational, separate and unitary individuals" might be called "the individualist discourse of the self" (Ibid.). Less generally, we can identify a political discourse of the 'third way' used by the UK's 'New' Labour party in the 1990s (Ibid.). Less generally again, Hagman (2003) identifies a discourse of the freedom provided by cars. Each discourse is constructed from what Bickerstaff & Walker (2002) call 'vocabularies of motive'. These are analogous to Potter & Wetherell's (1988) 'interpretive repertoires', which are "constituted out of a restricted range of terms" and "can be seen as the building blocks speakers use for constructing versions of actions, cognitive processes or other phenomena" (Ibid., 172). Using vocabularies, people build discourses; each presenting a particular stance. There may be multiple discourses based on one vocabulary. People might speak positively or negatively about an issue, but both positions could be expressed using similar words. Discourses express positions, while vocabularies do not presuppose any stance.

In summary, both studies reported in this thesis aimed to propose motives for commuting by particular travel modes. 'Propose' rather than 'identify' because it is argued that while people may have 'inner realities', we have no way of directly accessing them and so cannot be so certain as to claim 'identification'. But we can attempt to use reliable methods of data collection and analysis to make an informed, logical case for our proposals. The assumption – based on a long tradition of attitude-behaviour research – underlying both studies 1 and 2 is that intentions and behaviour are directed (to some extent) by "intrapsychic structures... such as attitudes" (Burr, 1998, 21) that are expressed using language. Although there may be "life beyond the account" (Hollway and Jefferson, 2005, 151), the account is all that is knowable. On this basis, it is argued that the research presented in this thesis develops the attitude-behaviour approach rather than discarding it. The development comprises a re-statement of the approach's assumptions in less emphatic terms than is traditional. 'Attitudes' are seen as a useful notion, but not phenomena of whose existence we can be sure.

## Chapter 3

# Literature review 1: influences on travel mode choice and acceptance and effectiveness of car-use reduction measures

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### 3.1 Introduction: scope of the chapter

This chapter reviews research on factors influencing travel mode choice, as well as studies of modal preference, acceptance of car-use reduction measures and such measures' effectiveness. Each of these may influence how (and if) people travel.

Most of the studies reviewed are from the discipline of environmental psychology, one branch of which brings "psychological knowledge to bear upon the issue of developing an ecologically sustainable society" and "explores environmental attitudes, perceptions and values" (De Young, 1999). But research from other disciplines was also included. For example, studies from sociology (e.g. Hjorthol, 2001), transport demand management (e.g. Kuppam and Pendyala, 2001), transport policy (e.g. Marshall and Banister, 2000) and planning (e.g. Rodríguez & Joo, 2004) all provided relevant information. In accordance with the scope of the thesis, the review focused on modes commonly used for commuting and did not cover air or sea travel.

The review aimed to identify influences that are consistently linked with modal choice and/or decisions about whether to travel, to examine methods used to obtain these findings and to illuminate issues that could be empirically investigated in this thesis. Congruent with its environmental-psychological perspective, the review structure echoes Stern's (2000) assessment of progress *Toward a Coherent Theory of Environmentally Significant Behavior* (ESB). Stern identifies four types of influence on ESB: attitudinal (i.e. psychological), contextual, personal capabilities and habits (*Figure 3.1*). These are discussed in relation to travel behaviour in section 3.3. There is some deviation from Stern's schema because of overlap between his categories. What anyone can do with their capabilities depends on their context, so personal capabilities are treated alongside contextual factors in section 3.3.2. Before examination of influences on modal choice, section 3.2 describes traditions in research on travel psychology and behaviour. Later, section 3.4 discusses overarching issues such as



attitude-behaviour causation and social desirability as a source of bias in data, section 3.5 explores the idea of travel as a social dilemma, section 3.6 examines car-use reduction policies and section 3.7 presents conclusions.

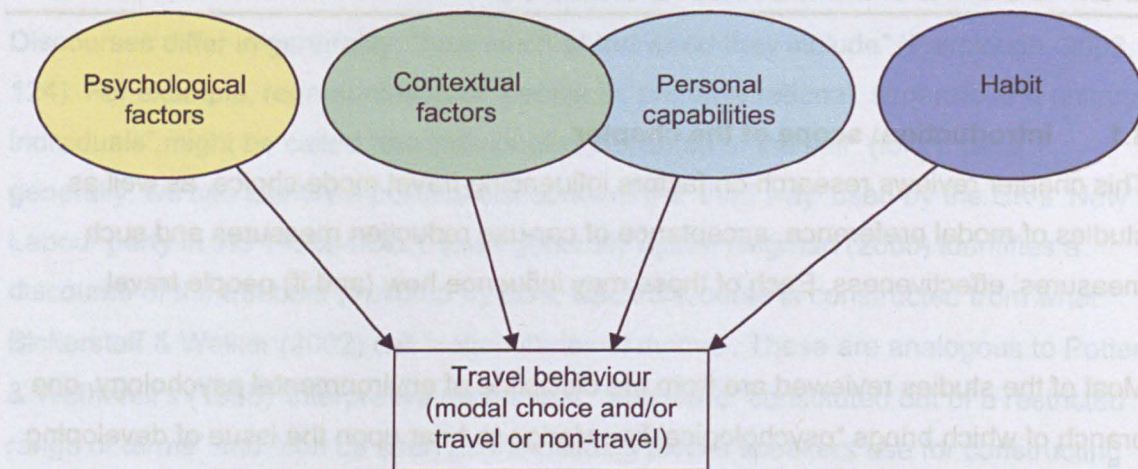


Figure 3.1 Influences on travel behaviour (cf. Stern, 2000)

Review material was identified from the British Library database (Zetoc, 2005), the Social Sciences Citation Index (SSCI, 2005) and the Sciences Citation Index (SCI, 2005). Each database was searched for “travel/transport AND behaviour/behavior”. Publications were also sourced through personal communication with researchers (e.g. Gatersleben and Uzzell, 2001), UK government web sites (e.g. DfT, 2003a) and on-line bibliographies (e.g. SUT, 2005). This provided a list of 39 publications for review.

## 3.2 Research traditions

### 3.2.1 Beyond rational-choice

Academic research on travel behaviour began in earnest during the 1960s, in response to congestion (Salomon and Mokhtarian, 1997). Research initially sought infrastructural solutions; how best to expand road networks to accommodate demand. Through the 1970s the emphasis changed to managing existing infrastructure, but by the 1980s “there was an increasing realization that altering human behaviour was the necessary next step” (Ibid., 108). These changes in research focus coincided with acknowledgement that travel causes problems beyond congestion. By the 21<sup>st</sup> Century many negative consequences had been identified. Steg (2003, 27), for example, lists: emissions contributing to “global warming, smog and acid precipitation”, use of “scarce

raw materials", habitat disruption, accidents, noise, social exclusion of non-drivers and shifting of costs from motorists to society.

Thus, researchers have investigated travel behaviour with the aim of understanding how to lessen the associated negative impacts. The oldest tradition in this field uses rational-choice models, whereby "individuals are assumed to maximise the utility or net benefits stemming from the transportation mode selected" (Rodríguez & Joo, 2004, 155) and "travel is assumed to be derived from human desires... to participate in other, non-travel activities" (Kuppam & Pendyala, 2001, 35). Travel is seen as a means to an end and a cost to be minimised.

Rational-choice theory is not unique to psychology. According to the *Oxford Dictionary of the Social Sciences*, it "underlies most work in economics and a considerable body of research in other social sciences" (Calhoun, 2002). Indeed, early travel behaviour research was not psychological at all, but took an economic perspective; explaining behaviour in terms of financial and time costs (Salomon & Mokhtarian, 1997).

Psychology has borrowed from rational-choice theory, however. Ajzen's (1991; 1991a) widely-used (Matthies, 2003) theory of planned behaviour (TPB) exemplifies this. Its attitude (ATT) construct captures evaluations of whether an action would have good or bad outcomes; usually measured in terms of instrumental (dis)benefits (e.g. Boldero, 1995). Although TPB studies often focus on evaluations of one behaviour rather than a choice of options, the TPB – like classical rational-choice theory – treats "individuals as rational maximizers of their interests" (Calhoun, 2002; also see Chapter 4). Thus, the TPB can be seen as an extension of rational-choice theory.

The rational-choice approach to travel has been criticised on various grounds. Steg, Vlek & Slotegraaf (2001, 151f) suggest that while instrumental considerations such as time and cost do influence travel behaviour, "motives having to do with affect and symbolic functions" are also important. Similarly, Anable & Gatersleben (2005, 164) argue that "travel may have a positive utility of its own which is not necessarily related to reaching a destination". Attention has focused on non-instrumental benefits of driving in particular, with Steg & Uneken (2002, 466) proposing that "people buy and drive cars simply because they like to, and not (only) because they have a real utilitarian need".

Besides failure to acknowledge non-instrumental motives, two further criticisms have been levelled at rational-choice models. Firstly, the information on which people base decisions can be inaccurate (Steg, 2003). For example, the price of driving may be underestimated and that of alternatives overestimated. Secondly, travel is often habitual and thus removed from rational-choice (e.g. Aarts and Dijksterhuis, 2000).

Although rational-choice modelling persists (e.g. Rodríguez & Joo, 2004), many attempts to explain modal choice, preference and/or acceptance of transport policies now examine a wider range of motives than instrumental concerns alone (e.g. Handy, Weston and Mokhtarian, 2005; Steg, 2005). This thesis adds to this body of work.

In discussing travel psychology, it should be noted that this thesis – concerned with psychology and behaviour in terms of influences on modal choice – sits within the wider field of 'traffic and transport psychology'. One eminent researcher defines this field as "psychological intervention or psychological support for intervention in the field of traffic" (Huguenin, 2005, 4). This includes such diverse issues as driver aggression (e.g. Wiesenthal, Hennessy and Totten, 2003), driving style (e.g. Taubman, Mikulincer and Gillath, 2005) and driver co-ordination (e.g. Treffner and Barrett, 2004). Although concerned with psychological influences on transport-related behaviour, these branches of traffic and transport psychology do not relate to modal choice and so are excluded from this review.

### *3.2.2 Quantitative and qualitative approaches*

Most research reviewed here used quantitative methods; often administering questionnaires to large samples and examining determinants of modal choice and/or extent of use of particular modes (e.g. Walton, Thomas and Dravitzki, 2004). Questionnaires were sometimes accompanied by travel diaries. Usually data from these were also quantitative; for example, numbers of trips by different modes (e.g. Gärling, Gärling and Johansson, 2000).

The cumulative findings of quantitative work on travel mode choice have led Hagman (2003, 4) to comment that "these arguments should be familiar to us. We have heard them all before. Our focus of interest, therefore, should not be on the arguments themselves, but on how they are presented so as to make sense." This is offered as justification for taking a discourse-analytic approach to qualitative interview data. Few



others have adopted this suggested approach, however. Qualitative studies of modal choice are relatively rare (e.g. *Ibid.*; Dowling, 2000) and our understanding might benefit from using methods that allow people to discuss travel in their own terms rather than in terms of abstract psychological theory that may seem unconnected to their everyday experience.

The strengths of quantitative and qualitative methods (e.g. the capacity to study large groups using the former and individual idiosyncrasies using the latter) led to both being employed in this thesis (in the studies reported in Chapters 5 and 6, respectively). The review presented in this chapter illuminates another important methodological issue. Steg, Vlek & Slotegraaf (2001) carried out a study showing that how people evaluate different travel modes can depend on the methods used to elicit evaluations. The detail of this study is saved until section 3.4, but it bears pointing out at this stage that using multiple methods in one study can help to provide more robust results (see also Chapter 6, section 6.2), yet this is uncommon in the research reviewed here.

### **3.3 Influences on modal choice, modal preference and acceptance of car-use reduction measures**

#### **3.3.1 *Psychological influences***

Many travel psychology studies ask why people choose particular modes or accept or reject measures aimed at reducing car use; often examining the psychological motives that Stern (2000, 414) calls “attitudinal factors, including norms, beliefs, and values”. Such work is reviewed in section 3.3.1.

##### **3.3.1.1 *Instrumental evaluations of travel modes***

As noted in section 3.2, instrumental evaluations of different behaviours (e.g. travelling by different modes) are the basis of rational-choice models. Although much recent travel psychology research has also examined other motives, instrumental evaluations remain a key concern. For example, studies using different methods and populations report positive evaluations of cars’ instrumental functions.

Hagman (2003, 3), in interviews with Swedish drivers, found that “many talk about convenience and flexibility. The car makes life easier.” Several quantitative studies corroborate this. In England, over 70% of Gatersleben & Uzzell’s (2001, 11) sample agreed that driving is “easier, quicker and cheaper than using public transport.” Anable



& Gatersleben (2005, 172) found that on “two important instrumental factors, flexibility and especially convenience, car users evaluate their own mode much more positively than other modes.” Ellaway *et. al.* (2003) found similar views in Scotland, while Exley & Christie (2002, 18) report that across the UK “large majorities among car users claim that significant reductions in their driving would be inconvenient.” Each of these studies elicited comparisons of driving with other modes; echoing the rational-choice approach whereby people supposedly maximise utility by choosing from competing options.

Occasional studies show cars’ instrumental functions not being rated particularly highly. In Holland, Steg (2005) measured eight such evaluations of driving, including its speed and cost ( $\alpha = .87$ ). (Cronbach’s  $\alpha$  statistic indicates the internal reliability of a multi-item scale; the extent to which it measures one underlying idea. See Chapter 5, section 5.4.2.1 for a mathematical explanation.) Scores ranged from 1 (negative) to 25 (positive). Even those who always commuted by car had a mean of only 12.8 (11.0 for those who also used other modes). These evaluations of cars’ instrumental performance were not particularly positive or negative, but this finding is unusual.

Few studies use specific instrumental evaluations to explain modal choice in multiple regression analysis; a technique that measures relationships between predictor (or ‘independent’) variables and an outcome (or ‘dependent’) variable by finding “the linear combination of predictors that correlate maximally with the outcome” (Field, 2000, 116). Steg (2005) is an exception, reporting that such evaluations had no significant effect (at .05 level) on commuting mode, while evaluations of cars’ symbolic (e.g. conferring status) and affective (e.g. giving pleasure) functions did. This may be because car and non-car commuters gave relatively similar evaluations of driving’s instrumental functions, meaning that these attitudes did not differentiate the groups.

Some studies focus on instrumental evaluations of non-car modes. Fujii, Gärling and Kitamura (2001) report that Japanese car commuters perceived public transport as taking longer than driving to work. However, after using public transport (during a freeway closure), their perceptions changed. The larger this change, the more likely people were to continue using public transport once the freeway reopened. However, enforced reconsideration of travel behaviour may be rare for most drivers, so perceptions of public transport could endure for long periods.

Anable & Gatersleben (2005) found that drivers evaluated cars as more environmentally-damaging than public transport, walking and cycling ( $F(3,222) = 131.31, p < .001$  for commuting;  $F(1,584) = 173.68, p < .001$  for leisure). However, this was the only one of six instrumental evaluations on which cars did not score highest and drivers apparently chose this mode because it was seen as superior on more important characteristics such as flexibility and convenience. Furthermore, users of various modes rated their satisfaction with these modes. Frequent public transport users were only satisfied with environmental performance and were dissatisfied with all five other instrumental functions. Such findings are echoed by a UK survey in which satisfaction with 13 aspects of bus services ranged from a high of 54% for "Number of places can get to" to a low of just 22% for "Frequency in evenings" (DfT, 2003a).

In Holland, Steg (2003) found that drivers rated the car more highly than public transport in terms of convenience, flexibility, comfort, speed and reliability. The only instrumental evaluation on which public transport scored higher was safety.

Interestingly, Nilsson & Küller (2000) found that attitudes to public transport were not significantly correlated ( $r = -.03, p > .05$ ) with modal choice among their Swedish sample. Their four-item attitude scale referred to cost, comfort, speed and reliability ( $\alpha = .48$ ). They suggest that instrumental evaluations of "public transport seemed to have no influence on travel behaviour. It may be that journeys with public transport depend more on attitudes toward the car than on attitudes toward public transport" (Ibid., 229). However, given that most studies suggest that people see personal benefits from driving, perhaps some other aspect of car use is negatively perceived. Possibly public transport users see environmental protection as more important than their own utility (see Anable & Gatersleben, 2005). This would be congruent with Nilsson & Küller's (2000) suggestion that attitudes to car use differentiate drivers from public transport users and with the general finding that many people see driving as a way to maximise personal utility. Indeed, Hagman (2003) notes that although Swedes generally spoke positively about cars' instrumental functions, they did identify environmental damage as a problem. Further research could test the idea that the relative weight given to travel modes' personal and environmental (dis)benefits may influence modal choice.

In defining the TPB's ATT construct, Ajzen (1991a) states that any evaluation that is measurable on a *negative/positive* scale indicates ATT in this specific sense, as

opposed to Stern's (2000) more general 'attitudinal factors'. Instrumental evaluations of travel modes meet this criterion.

Bamberg & Schmidt (2003) – applying TPB to explain commuting mode in Germany – took ratings (in TPB terms, 'behavioural beliefs') of driving's flexibility, speed, comfort and stress. These were combined and the resulting scale used to predict overall ATT to driving. ATT itself was measured by items asking whether car commuting was *good/bad* and *pleasant/unpleasant*. A perfect relationship is reported, with the four evaluations accounting for 100% of variance in ATT. The standardised path coefficient from ATT to behavioural intention (BI) (to drive or not) was  $\beta = .32$  ( $p < .05$ ). ( $\beta$  shows "by how many standard deviation units the dependent variable will change for one standard deviation unit change in the independent variable"; Bryman and Cramer, 2001, 257). However, given that one behavioural belief (stress) was arguably affective (Anable & Gatersleben, 2005), it is hard to know what proportion of ATT comprised instrumental evaluations. Pleasantness is arguably an affective judgement as well (Nilsson & Küller, 2000; Steg, 2005), making it unclear how much of the ATT-BI effect was attributable to instrumental and affective evaluations, respectively.

Bamberg & Schmidt's (2003) approach reflects Ajzen's (1991a) conception of ATT; capturing instrumental *and* affective evaluations. But some studies treat these as distinct aspects of travel. For example, Anable & Gatersleben (2005) found that instrumental and affective motives had different influences on modal choice. Steg, Vlek & Slotegraaf (2001) and Steg (2005) report similar findings from Holland. These studies suggest that while Ajzen's (1991a) overall ATT construct does capture influences on travel mode choice, instrumental and affective evaluations may be best treated separately so that their effects can be isolated.

In conclusion, several travel psychology studies echo rational-choice theory; eliciting comparisons of different modes' instrumental functions. Generally, cars are said to provide more personal benefits (e.g. convenience) than alternatives. However, because this perception is often shared by drivers and non-drivers, it may not explain modal choice. The importance placed on environmental rather than personal utility may be a more useful distinguishing factor. Various studies report that people see non-car modes as less environmentally-damaging than driving and the weight given to this outcome may influence whether people drive or use other transport modes. There is

also some evidence that drivers' negative perceptions of non-car modes may be revised after using those modes, but there is a catch-22, since people are unlikely to try a mode that they perceive negatively unless forced to do so.

### 3.3.1.2 *Affective evaluations*

"Affective factors refer to the feelings evoked by travelling, such as stress, excitement, pleasure, boredom and control" (Anable & Gatersleben, 2005, 164). While many studies distinguish affective from instrumental aspects of travel (e.g. Ibid.; Nilsson & Küller, 2000), common definitions and measures remain elusive. For example, Steg, Vlek & Slotegraaf (2001) refer to all non-instrumental aspects as 'symbolic-affective' (including self-presentation, social comparison and emotions experienced while travelling), while Anable & Gatersleben (2005) distinguish 'affective' (e.g. feelings of relaxation) from 'social' (or 'symbolic') aspects (e.g. feelings of superiority).

Thus, there are questions over what should be characterised as affect. For example, Anable & Gatersleben (Ibid.) identify feelings of control as an affective 'experience of travel', while Steg (2005) suggests that control relates to the 'independence' of driving and is distinct from 'symbolic-affective aspects of car use'. Similarly, evaluations of the car's privacy loaded higher on the 'instrumental' factor (.42) than the 'symbolic-affective' factor (.28) in Steg's (Ibid.) factor analysis, although privacy was identified as a 'symbolic-affective' motive by Steg, Vlek & Slotegraaf (2001). (See Chapter 5, section 5.4.1 for an explanation of factor analysis.)

Greater clarity might be achieved by distinguishing affect from its causes. Colman (2001, 16) defines affect as "emotion or subjectively experienced feeling". Where Anable & Gatersleben (2005) identify 'excitement' and 'control' as affective experiences, one could argue that the former fits this definition, but the latter may be better regarded as *causing* an emotion. The same might be said of privacy, while stress and pleasure seem to be emotions in and of themselves. Untangling these relationships in future studies would build on existing findings suggesting that affect plays some role in directing travel behaviour.

Among these findings, Steg (2005), using multi-item measures of pleasure ( $\alpha = .81$ ) and arousal ( $\alpha = .70$ ), investigated whether these and other variables contributed to explanation of self-reported commuter car use. Neither instrumental evaluations nor

pleasure were significant, but arousal (whether driving was stressful) was a significant predictor ( $\beta = -.21, p = .024$ ).

Anable & Gatersleben (2005) report that drivers, cyclists and pedestrians evaluated commuting significantly more positively than public transport users in terms of excitement and feelings of control ( $F(3,222) = 8.09$  and  $F(3,222) = 34.37$  respectively, both  $p < .001$ ). However, drivers did not rate these experiences as important; emphasising instead the car's instrumental functions. Cyclists and pedestrians, conversely, said that affective experiences were important to their modal choice. Echoing Anable & Gatersleben's findings regarding car use, Bamberg & Schmidt (2003) report that measures of whether driving made respondents feel "in high spirits/energetic" and "happy/joyful" were not significant predictors (at .05 level) of self-reported car use for commuting, while instrumental evaluations were.

Nilsson & Küller (2000) found that a four-item measure ( $\alpha = .63$ ) of "car affection" (e.g. "It's pleasant to drive") correlated positively with self-reported annual car mileage ( $r = .46, p < .01$ ) and negatively with acceptance of car-use reduction policies ( $r = -.41, p < .01$ ). Although they also report a regression assessing the contribution of various factors to explaining mileage and policy acceptance, 'car affection' was combined with other psychological variables into a single predictor. It is, therefore, impossible to say how much variance in either outcome variable can be attributed to affect.

Overall, there are mixed findings concerning affective influences on travel. This may be partly due to methodological differences between studies. Steg, Vlek & Slotegraaf (2001) found that the relative importance of affective and instrumental motives depended on how they were measured. They propose that when the task's purpose is apparent (e.g. semantic-differentials), people tend to "reason about their car use in a socially desirable way" (Ibid., 165). People may not express enjoyment of driving if they think that others disapprove of it, preferring to emphasise its instrumental functions. However, when the task's purpose is less obvious (e.g. similarity sort of car-use episodes), people rate driving's affective aspects more positively. This may explain why some studies show that people do not have affective motives for driving (e.g. Anable & Gatersleben, 2005; Bamberg & Schmidt, 2003), while others do (e.g. Steg, 2005).

It may also be that differences in the wording of semantic-differentials – for example, between measurement of pleasure from driving by Steg (2005) and Nilsson & Küller (2000) – lie behind some seemingly contradictory results. As suggested above, there is a need for standardisation in measuring affective motives for travel, preferably in a way that avoids encouraging socially-desirable responses.

Qualitative research often forgoes standardised measures, but still offers some consistent findings. Hagman (2003) and Handy *et. al.* (2005) report that participants spoke positively about the privacy afforded by cars and simple enjoyment of driving. For example, US interviewees in the latter study remarked that “the only place I actually had any real privacy was my car” and “I love driving. I just enjoy it” (Ibid., 192f). Of course, positive affective evaluations of travel are not restricted to drivers. From interviews with UK bicycle commuters, Gatersleben (2003, 180) concludes that “Those who cycle appear to do so simply because they like cycling”; echoing Anable & Gatersleben’s (2005) quantitative finding that cyclists and pedestrians rated affective experiences as important to modal choice.

To conclude, although generalisation is difficult because of the variety of affect measures used by travel psychologists, one can say that affective experiences do appear to influence modal choice. Pleasure, stress, control, excitement and privacy have all been identified as relevant, supporting the argument that rational-choice theory’s instrumental focus ignores some motives for travel (Steg & Uneken, 2002). Although some studies suggest that affect is relatively unimportant compared to instrumental motives (especially for drivers), Steg, Vlek & Slotegraaf (2001) show that such findings should be treated cautiously. People may be wary of expressing affective motives for driving because of concerns that these will be frowned upon. Users of other modes seem less reluctant to express affective motives. There is a need for travel psychologists to agree on what constitutes affect, what causes affective responses and how these factors should be measured to minimise social-desirability bias.

### 3.3.1.3 *Social motives*

Travel psychology takes two distinct approaches to social motives. One is fairly narrow; echoing Ajzen’s (1991a) subjective norm (SN) construct. This captures perceived social pressure surrounding an act (e.g. the perception that driving is disapproved of); known as an ‘injunctive norm’ (Steg, 2005). The second conception is broader,

accounting for how people present themselves, as well as for external pressure. This is a more reflexive view, assuming that people act on the social environment as well as reacting to it. This view also sees social motives overlapping with affect. For example, Anable & Gatersleben's (2005) 'feelings of superiority' are affective but also imply social comparison.

Based on a literature review, Steg, Geurs & Ras (2001, 791) identify SN as a "motivational factor... related to car use and travel-mode choice", but note that because most studies measure attitudinal factors and behaviour simultaneously, we cannot be certain about causal direction (see section 3.4). Even setting aside this uncertainty, evidence regarding SN is somewhat mixed.

In Germany, Hunecke, Blöbaum, Matthies and Höger (2001) found that SN influenced self-reported modal choice ( $\beta = .19, p < .05$ ), but Klöckner & Matthies (2004) found no such effect when SN was used as a regression predictor alongside personal norm (PN) and driving habit. (PN is a construct from Schwartz's (1977) norm-activation theory (NAT) that captures feelings of personal obligation for specific acts. See section 3.3.1.4 and Chapter 4.) In Holland, Harland, Staats and Wilke (1999) report that SN influenced intentions to use non-car modes ( $\beta = .18, p < .001$ ), but this influence lessened ( $\beta = .15, p < .01$ ) when PN was entered as a regression predictor alongside the TPB variables (ATT, SN and perceived behavioural control, or PBC, which is examined in section 3.3.1.5). SN had no significant influence when self-reported travel behaviour, as opposed to future intentions, was regressed on these predictors. Steg (2005) – whose study is unusual in measuring descriptive norms (perceptions of others' behaviour) alongside injunctive norms – reports that the perceived expectations of family influenced self-reported level of car use for commuting ( $\beta = .23, p = .018$ ), but the perceived expectations of colleagues and friends did not. A descriptive norm measure asking how family, colleagues and friends commuted ( $\alpha = .62$ ) actually had a stronger influence on behaviour ( $\beta = .30, p < .001$ ) than the injunctive norm.

Bamberg & Schmidt (2003) found that SN was especially important to students' self-reported modal choice for travel to university. In a test of the TPB, SN had a stronger influence ( $\beta = .40, p < .05$ ) on intentions to use car or non-car modes than ATT or PBC. When included in a model containing constructs from the TPB, NAT and Triandis' (1977) theory of interpersonal behaviour (TIB), SN's influence on intentions remained

significant ( $\beta = .23, p < .05$ ) and only role beliefs had a stronger effect. Indeed, Bamberg & Schmidt (2003, 280) argue that “SN is probably too narrow to reflect all the social factors influencing the intention building process” and that an adequate social-influence variable should capture perceived pressure and “self-ascribed social role”. This calls to mind the second, broader approach to social influences on travel behaviour, mentioned at the start of this sub-section.

Steg, Vlek & Slotegraaf (2001) elaborated this broader approach; investigating whether symbolic aspects of driving (relating to self-presentation and social role) could be differentiated from affective and instrumental ones. Three methods (similarity sort, Q-sort and semantic-differentials) showed that evaluations of these three aspects were distinct. Links between preference for particular aspects and use of particular modes were not examined, but this work raises the possibility that symbolic functions (e.g. feeling that “driving a car is sporty and adventurous”) may satisfy “the need to express yourself and your social position” (Ibid., 164). While Steg, Vlek & Slotegraaf offer no evidence for this generic ‘need’, their statement echoes Csikszentmihalyi and Rochberg-Halton’s (1981) research on use of everyday symbols (e.g. cars) to express meaning. These authors suggest that people use artefacts not only for instrumental reasons, but also because artefacts project the user’s personality, reinforcing sense of self and showing this desired self to others. Indeed, Steg’s (2005) later work develops Dittmar’s (1992) theory of material possessions, which asserts similar ideas to Csikszentmihalyi and Rochberg-Halton’s. Steg (2005) found that (self-professed) frequent drivers had significantly higher scores than infrequent drivers on a five-item measure of symbolic-affective evaluations of driving ( $\alpha = .90$ ), including an item asking the extent to which “The car gives me prestige” ( $F(2,169) = 3.6, p = .04$ ). Moreover, a seven-item social comparison and self-presentation scale (e.g. “Travelling by car suits me better than travelling by bike or public transport”,  $\alpha = .64$ ) significantly influenced self-reported level of commuter car use ( $\beta = .19, p = .026$ ).

Ellaway *et. al.* (2003) compared car and public transport commuters on several variables, including whether they felt that others would like to use their mode and whether that mode made them feel that they were “doing well in life”. Controlling for age and social class, drivers had significantly ( $p < .001$ ) higher scores than public transport users, suggesting that driving conferred greater status.



In conclusion, there is evidence of various social influences on travel. Subjective norms (SN) have been shown to influence modal choice in some settings, especially where peer pressure may be strong (Bamberg & Schmidt, 2003). Elsewhere SN has not contributed significantly to explained variance in modal choice (e.g. Klöckner & Matthies, 2004), although there are fewer negative than positive results concerning SN's effect. Notably, where SN is non-significant, PN is often a significant regression predictor. This supports Schwartz's (1977) argument that PN accounts for SN (because people's normative self-expectations depend, partially, on perceived social pressure).

There has been little work on descriptive norms as determinants of modal choice, although Steg's (2005) results suggest that future studies might usefully examine this influence. More attention has been paid to travel modes' symbolic functions and, again, this seems to be a useful research avenue. Travel behaviour is influenced by interacting with – not just reacting to – the social world. Travel psychologists have begun to draw on other areas of psychology to explore these issues (e.g. Steg's (2005) use of Dittmar's (1992) theory of material possessions) and such work may help to explain why rational-choice modelling often does "not seem to give sufficient explanations of car use" (Steg, Vlek & Slotegraaf, 2001, 152). Results indicate that cars confer greater status than public transport (Ellaway *et. al.*, 2003), that drivers value status more than users of other modes, and that modal choice can be influenced by a desire to present a particular image (Steg, 2005).

#### 3.3.1.4 *Personal responsibility and obligation*

When choosing travel modes based on instrumental or affective functions, people seek personal benefits. Social motives are also self-interested, with people seeking to present a desired image to others, to demonstrate their status, or to comply with others' expectations in order to gain approval (Schwartz, 1977).

The literature shows that non-selfish concerns can also direct travel behaviour. Many studies examine these concerns using Schwartz's (*Ibid.*) NAT, which proposes that some behaviours (termed 'altruistic') are performed for others' benefit. When an individual values another's welfare, believes that their own actions have consequences for it (awareness of consequences, or AC) and feels personal responsibility for those consequences (ascription of responsibility, or AR), they will feel moral obligation to protect that welfare. This normative self-expectation is captured by the PN construct,

which is altruistic behaviour's immediate psychological antecedent. (See Chapter 4 for more details of NAT.)

Although Schwartz developed NAT to explain altruism towards people, environmental psychologists have adapted it for situations where non-humans are valued (e.g. Stern, 2000). Several studies have investigated obligation (PN) for pro-environmental behaviours, including use of non-car modes which are assumed to be less environmentally-damaging than automobiles because of their lower emissions per passenger mile, lesser contribution to congestion and so on (see Chapter 1).

Nordlund & Garvill (2003, 343) operationalised PN by asking Swedish respondents whether "they perceived it to be a personal moral obligation to reduce car use." The path from PN to the outcome variable – willingness to drive less – was  $\beta = .44$  ( $p < .05$ ). Harland *et. al.* (1999) found that PN – when entered as a regression predictor alongside TPB variables – had significant effects on intentions to use non-car modes ( $\beta = .16$ ,  $p < .05$ ) and on self-reported use of such modes ( $\beta = .37$ ,  $p < .001$ ).

In Germany, Klöckner & Matthies (2004) report that PN was the only significant ( $p < .05$ ) predictor of self-reported commuting mode when entered into a regression with SN and driving habit, while Matthies, Kuhn and Klöckner (2002) found significant ( $p \leq .01$ ) paths from PN to three regression outcome variables: intention to use public transport, preference for public transport and self-reported public transport use. Bamberg & Schmidt (2003) report that PN had a significant effect on self-reported car use ( $\beta = -.38$ ,  $p < .05$ ). Thus, several studies show PN's influence on modal choice.

Bamberg & Schmidt's (*Ibid.*) study is relatively unusual because it measured AR. Schwartz (1977) proposed that this construct operates alongside AC to activate PN. Bamberg & Schmidt (2003) report this effect, with AR-PN  $\beta = .55$  ( $p < .05$ ). Tanner (1999) also measured AR, using three items asking about respondents' feelings of responsibility for addressing driving-related problems ( $\alpha = .80$ ). AR had a significant influence on self-reported driving frequency ( $\beta = -.29$ ,  $p < .001$ ), but its relationship with PN was not assessed.

Hunecke *et. al.* (2001) used items asking about personal responsibility for problems caused by driving, but included these in their PN scale ( $\alpha = .83$ ) rather than

constructing an AR scale that could be used to predict PN. The path from this combined responsibility/obligation variable to self-reported modal choice was  $\beta = .22$  ( $p < .01$ ). Other studies have asked about responsibility, but outside the context of NAT. For example, Gatersleben & Uzzell (2001) report significant ( $p$  not specified) Pearson correlations of .25 to .30 between AR and two other variables: willingness and perceived ability to reduce car use. Although such results suggest that AR influences travel behaviour – perhaps indirectly, as Schwartz (1977) proposed, and directly – more systematic research is needed before its role can be generalised with the same confidence as PN's. This variable is a robust predictor of modal choice when measured by various methods in different settings.

#### 3.3.1.5 *Awareness of consequences*

AC, the second construct that Schwartz (Ibid.) proposed as a predictor of PN, has received more attention from travel psychologists than AR. Travel's perceived environmental consequences are often measured and there is evidence from various countries that driving is seen as environmentally-damaging and other modes less so (e.g. Gatersleben & Uzzell, 2001; Hagman, 2003; Joireman *et. al.*, 2004). There is theoretical overlap here with instrumental evaluations of travel. Some researchers treat beliefs about behaviours' impacts – including environmental impacts – as referring to instrumental outcomes rather than as part of a moral-normative cognitive process that activates PN (e.g. Anable & Gatersleben, 2005).

Travel studies – like other ESB research (see Chapter 4, section 4.5.3.3) – use two conceptions of AC. These can be termed 'condition-focused' and 'action-focused'. Action-focused conceptions refer to specific behaviours' consequences (e.g. Steg, Geurs & Ras, 2001). Condition-focused conceptions refer to the state of the environment (e.g. Bamberg & Schmidt, 2003). Neither is exactly the same as Schwartz's (1977) original AC construct; defined as a tendency to consider the consequences of one's actions for others (see Chapter 4, section 4.5.3.3). Nonetheless, they are treated as AC here because this is how AC is defined in the research reviewed.

Steg, Geurs and Ras (2001, 795) found that beliefs that "car use in the Netherlands contributes to environmental pollution" raised explained variance in self-reported annual car mileage from 21% to 26% when included as a regression predictor after

socio-demographic variables ( $\beta$  not reported). Steg & Vlek (1997, 473f) used correlational rather than regression analysis, but report that Dutch “respondents having a higher problem awareness [AC] actually used their cars less” (self-reported behaviour). Conversely, Walton *et. al.* (2004) found no significant difference (at .05 level) in perceptions of transport-related environmental problems between car and non-car commuters in New Zealand and Tanner (1999) found that beliefs concerning the consequences of driving for Swiss respondents themselves and for “animals and plants” did not predict self-reported driving frequency.

Thus, while some studies show significant AC-modal choice relationships, this effect is somewhat unreliable. There may be various reasons for this. Firstly, Schwartz (1977) suggested that AC's influence on behaviour is mediated by PN. To clarify,

a variable may be said to function as a mediator to the extent that it accounts for the relation between predictor and criterion... Whereas moderator variables specify when certain effects will hold, mediators speak to how or why such effects occur

(Baron and Kenny, 1986, 1176).

Indeed, Nordlund & Garvill (2003, 345) report a significant path ( $\beta = .46, p < .05$ ) from beliefs that driving causes environmental damage (AC) to PN, suggesting that “personal norm is central in the causal chain of effects from... general and specific problem awareness” to willingness to avoid car use. Secondly, where direct AC-behaviour effects are examined, a variety of other variables are included in analyses. For example, in Steg, Geurs & Ras' (2001) study, AC was the only psychological regressor among several socio-demographic variables, but Tanner (1999) included AC as a regressor alongside psychological constructs including perceived efficacy and AR. AC's influence may be lessened when other psychological influences are taken into account. Thirdly, different studies measure perceived consequences at different levels of specificity (e.g. Steg, Geurs & Ras' (2001) measure of consequences of driving and Tanner's (1999) measure of consequences of human behaviour more generally) and this may affect how strongly these variables are associated with specific actions.

Rather than examining determinants of behaviour, some research focuses on travel mode preferences or acceptance of car-use reduction measures. For example, Joireman *et. al.* (2004, 195) report that in their US study, “preference for commuting by

public transportation was higher... among commuters who more strongly believed that commuting by car harms the environment". Both Steg (2003a) and Steg & Vlek (1997) found that the higher Dutch respondents' awareness of environmental problems caused by driving, the more likely they were to accept car-use reduction policies. Gatersleben & Uzzell (2001) obtained similar results in the UK.

Related to – but distinct from – awareness of problems is concern over them. Nilsson & Küller (2000) found significant ( $p < .001$ ) relationships between stated concern over transport-related environmental damage and both self-reported annual car mileage and acceptance of car-use reduction policies. It is important to recognise that people may acknowledge some consequence of a behaviour (e.g. pollution arising from driving) without being concerned by it (see Chapter 6, section 6.5.1.6). As such, AC and environmental concern should be treated as distinct.

To conclude, there is some evidence of beliefs about travel's environmental consequences being related to modal choice, but this relationship is less reliable than the PN-behaviour effect. This is unsurprising, as Schwartz (1977) proposed that PN should mediate AC's influence on actions. There is also evidence of AC being positively related to acceptance of car-use reduction policies (e.g. Gatersleben & Uzzell, 2001; Steg & Vlek, 1997). There is a practical application here, as attempts to encourage pro-environmental behaviour often rely on pointing out environmental impacts, yet these usually have little lasting effect on people's actions (Collins, Thomas, Willis and Wilsdon, 2003). Their ineffectiveness may be due to overemphasis on information alone (see Chapter 7, section 7.4). Better results might be obtained by addressing norms and underlying values as well as AC. This relates to the observation that belief in an action's negative consequences does not entail concern over those consequences. Concern may only be engendered by addressing values (Ibid.).

#### *3.3.1.6 Perceived control, self-efficacy and perceived facilitating or inhibiting conditions*

Recognising work from other areas of social psychology (e.g. Ajzen, 2002; Bandura, 1997; Triandis, 1977), some travel psychology studies examine the perceived difficulty and/or possibility of performing particular actions (e.g. using non-car modes) as well as instrumental, affective and/or normative motives. According to Ajzen (2002, 667), perceived control over performance of a behaviour is "now a central feature of" attitude-

behaviour theories. Even strong motivations may not influence behaviour if people feel that action is – for whatever reason – too difficult.

Harland *et al.* (1999), for example, measured Ajzen's (2002) perceived behavioural control (PBC) construct, which taps the "perceived ease or difficulty of performing" an act (*Ibid.*, 665). Based on one item asking the extent to which respondents thought it likely that they could use non-car modes, PBC had a stronger influence on intentions ( $\beta = .42, p < .001$ ) than ATT, PN or SN and was also the most influential predictor of self-reported travel behaviour ( $\beta = .28, p < .001$ ).

Tanner (1999) produced a scale measuring perceived barriers to reducing car use from seven *yes/no* items asking whether certain conditions applied to respondents (e.g. "need to transport materials"). This variable had a stronger effect on self-reported driving frequency than any other predictor ( $\beta = .44, p < .001$ ). There are questions over the scale's validity, however. No reliability statistics are reported and the items included "colleagues' impression of me" and "inconvenience" as potential barriers to using non-car modes. The first of these seems to be an SN measure and the second an ATT measure (i.e. an instrumental evaluation of non-car modes). If this interpretation is accepted, Tanner's 'perceived barriers' scale actually tapped beliefs underlying all three TPB predictors, making it unsurprising that the variable should influence the outcome and impossible to pinpoint the exact nature of that influence.

Gärling *et al.* (2000) used diaries to assess whether Swedish participants met commitments to reduce their car use by up to 50% over a week. The average reported reduction was only 10%, implying that people found avoidance of driving difficult. (Statistics showing the range of reductions and individual differences are not provided.) Steg & Uneken (2002) found that although Dutch respondents did not rate instrumental aspects of car use for commuting particularly favourably ( $M = 12.1$  on a 1 to 25 scale), 59% always commuted by car. This, they suggest, may "be due to the fact that no feasible alternatives are available" (*Ibid.*, 473). Steg & Vlek (1997, 473) report interviews suggesting that many "people see no opportunities to reduce their car use, because, as they say, they already use their car as little as possible", while Klöckner & Matthies (2004, 326) found that respondents "think of work trips as being under low personal control". This theme is revisited in the studies reported in Chapters 5 and 6.

PBC does not always predict modal choice, however (e.g. Hunecke *et. al.*, 2001). There are several possible reasons for this. Perceived control may depend on journey type (e.g. commuting or leisure), perceptions of local public transport, participants' personal capabilities and/or different views of what is possible in a given context.

In conclusion, although some studies have done so, it would be useful for more to use PBC as a regression predictor and to establish whether this variable actually influences modal choice. Assertions that switching from car to non-car modes is seen as impossible often seem to be anecdotal (e.g. Klöckner & Matthies, 2004). It is also useful to examine beliefs underlying PBC in order to show why people do or do not feel control over their travel behaviour. Furthermore, travel psychologists might follow up some of the systematic research on PBC and Bandura's (1997) perceived self-efficacy (PSE) concept that has been undertaken outside the ESB domain. For example, Ajzen (2002) suggests – based on a review of empirical work concerning several behaviours – that PBC should be measured in terms of both perceived controllability (i.e. whether people could act if they wanted to) and PSE (i.e. people's confidence in their abilities pertaining to an action). Others argue that PBC should be decomposed into perceived ease/difficulty and perceived controllability components (e.g. Sparks, Guthrie and Shepherd, 1997; Trimafov, Sheeran, Conner and Finlay, 2002). Although travel research has begun to suggest PBC's role in directing modal choice, it may be falling behind theoretical developments outside this behavioural domain.

### 3.3.2 *Contextual influences (and their interpretation)*

Steg (2005, 159f) asserts that "Travel behaviour is to a large extent dependent on situational characteristics, which affect the availability and relative attractiveness of various travel modes and the necessity to travel." We should also note that views of what is possible with any resource (e.g. a bus service, one's physical abilities) arise from interactions between person and situation. Context must usually be interpreted.

This having been said, some contextual conditions probably do influence most people's travel behaviour in the same way. They are more-or-less non-negotiable. Factors such as having a driving licence and access to a car (Nilsson & Küller, 2000) or bicycle (Gatersleben, 2003; Nankervis, 1999) have been shown to influence modal choice. Without a licence one cannot (legally) drive and without a bicycle one cannot cycle.

Often, however, contextual conditions alone “are poor predictors of behavior, as individuals in similar objective situations may have different subjective perceptions or attitudes towards these factors, and therefore different responses” (Salomon & Mokhtarian, 1997, 115). Handy *et. al.* (2005) found this when investigating whether US participants drove out of choice or necessity. They conclude that “What appears to be a question of choice to an observer may be perceived as a matter of necessity by the individual. Finding an objective way to make such distinctions may simply be impossible” (Ibid., 188). This was certainly true in study 2 of this thesis, reported in Chapter 6.

The following sub-sections cover different types of contextual factors, beginning with physical and social environments before moving on to socio-demographic variables.

### 3.3.2.1 *Physical and social environments*

Despite problems of disentangling choice and necessity, several researchers have attempted to identify contextual influences on travel behaviour. Using an open-ended questionnaire item, Gatersleben (2003) found that people listed many reasons for driving rather than cycling to work. She divides these into ‘contextual’ barriers (e.g. weather, hills, darkness) and ‘personal’ barriers (e.g. needing to dress smartly, needing to combine commuting with other trips). This division seems rather misleading, as the identified ‘personal’ barriers are surely contextual. What differentiates them from hills and cycle lanes is that they are aspects of social rather than physical context. Characteristics such as physical fitness might be more accurately called ‘personal’. One could argue that social context should be treated under ‘social motives’ and indeed the perception that one cannot cycle because certain clothes are required for work can be seen as a subjective norm. However, some influences seem to fit into multiple categories. Although this complicates the task of classifying them, it reflects the acknowledged interaction between person and environment that stretches back at least to Lewin’s (1951) field theory.

Focusing on objective physical environments in the US, Rodríguez & Joo (2004, 169) found that “sloping terrain decreases the attractiveness of walking and cycling, while higher percentages of sidewalk available in the shortest route to a destination are correlated with a higher propensity to select the pedestrian mode.” Studies of this type differ from those like Gatersleben’s (2003). The former actually measure aspects of the



physical environment while the latter measure perceptions. This second approach is more common in the studies reviewed here.

Nankervis (1999) – examining influences on cycle or car commuting in Australia – combined both approaches, reporting many of the same perceived barriers to cycling as Gatersleben (2003) and adding the need to carry baggage. Nankervis (1999) also assessed the influence of season and weather on cycling. Although there were no significant differences across seasons, he found that (objectively-measured) wind and temperature correlated significantly with daily bicycle counts ( $r = -.209$ ,  $p = .011$  and  $r = .363$ ,  $p < .001$ , respectively), while rain was marginally significant ( $r = -.160$ ,  $p = .052$ ). The stronger the wind, the lower the temperature and the greater the chance of rain (according to local forecasts), the fewer cycle commuters were observed.

In opposition to Nankervis' (Ibid.) findings, Bergström & Magnusson (2003) report significant seasonal variations in Swedish cyclist numbers, probably because Sweden's winters are harsher than Australia's. There was also "a clear correlation between distance to work and mode choice... the number of trips by bicycle and on foot decreased while trips by car increased with distance" (Ibid., 654). Moreover, ratings of the importance of travel time differed between car and cycle commuters. Travel time was less important to the latter group than the former, reminding us that people interpret contextual conditions in different ways.

Also investigating travel time, Fujii *et. al.* (2001, 796) found that "drivers who more frequently commuted by automobile overestimated commuting time by public transport to a larger extent than did drivers who commuted less frequently by automobile." They report that "if high-frequency drivers use public transport at least once, their overestimates of public transport commute time are corrected, leading to an increase in the frequency of public transport use" (Ibid., 805). Again, this underlines the importance of *perceived* context. If perceptions change, behaviour change may follow.

Rather than time costs, Hunecke *et. al.* (2001) examined financial costs. They manipulated the price of subway travel by providing free tickets to some participants. A significant difference was found in self-reported level of subway use between those with and without free tickets ( $F(1,156) = 6.00$ ,  $p < .01$ ). Even after the study, subway use was maintained among those who had received free travel. At first glance this

seems to mirror Fujii *et. al.*'s (2001) finding that drivers continued to use public transport after experiencing it. However, Hunecke *et. al.* (2001) note that their control participants (who did not receive free travel) also used the subway more after the study. They suggest that simply recording one's behaviour in a diary may prompt modal switch. Alternatively, external events (e.g. major roadworks) may have led to a general increase in subway use at this time.

Jakobsson, Fujii and Gärling (2002) also manipulated travel costs, this time in Sweden. Drivers were charged per km of driving during a designated period. Although there is some evidence that charging led to reduced car use, effects were only marginally significant. Based on interviews with participants, Jakobsson *et. al.* conclude that economic disincentives for car use may be ineffective in promoting modal switch because people often feel that they use their cars as little as possible already. This is congruent with some of the findings on perceived control reported in section 3.3.1.6. Alongside Hunecke *et. al.*'s findings (2001), it also suggests that lowering the price of non-car modes may encourage modal switch more than raising the cost of driving.

Salomon & Mokhtarian (1997) make a further comment about financial costs when discussing factors influencing switching from driving to other modes: "the previously sunk cost invested in the automobile often presents a barrier to change" (*Ibid.*, 119). Although they cite no empirical evidence for this assertion, it is supported by study 2 of this thesis (see Chapter 6, section 6.5.2.2).

In conclusion, many aspects of physical and social context seem to influence travel behaviour. Some, like vehicle ownership, are more-or-less non-negotiable, but most must be interpreted. For example, as Gatersleben (2003) notes, some people willingly cycle in rain or over long distances. The extent to which anyone voluntarily does so probably depends on other psychological characteristics. If somebody enjoys cycling or values its environmental benefits, they may ride regardless of barriers. This is likely to be true of any mode, with more effort being made to overcome barriers where there is strong internal motivation.

Beyond cycling, there is evidence that modal choice is affected by perceived journey time and financial costs. The limited findings suggest that drivers may overestimate

travel time by non-car modes and that reducing the cost of these modes may be more effective in encouraging modal switch than raising the cost of car use.

Most studies of physical environments' effect on travel measure perceived barriers rather than objective contextual features and those that take objective measures rarely examine perceptions (although see Nankervis, 1999). Given sufficient resources, studies could compare perceived and objective context. Gatersleben, Steg and Vlek (2002) took this approach to household energy use, comparing perceived and actual energy consumption and reporting that "respondents who indicate they behave more proenvironmentally do not necessarily use less energy" (Ibid., 335). It would be interesting to see whether there is a similar mismatch between perception of factors facilitating or inhibiting use of different travel modes and the actual context in which people travel.

#### 3.3.2.2 Socio-demographics

A further set of contextual influences on travel comprises people's socio-demographic characteristics. Although not external in the same sense as physical environments, such characteristics are clearly distinct from psychological motives. Sometimes socio-demographics can be seen as proxies for other variables that may directly influence modal choice (e.g. physical abilities may be associated with age). This is not always the case, however. For example, women in Romany culture do not learn to drive (CoE, 2005). Their gender can be said to directly affect how they travel.

Root & Schintler (1999, 354), commenting on *Women, motorization and the environment*, suggest that "mass transit is often not seen as a practical or safe alternative for women." No specific evidence is cited, although Ellaway *et. al.* (2003) touch on this issue, reporting that Scottish women felt less protected than men on public transport. Exley & Christie (2002, 17) also note that in the UK "More people feel unsafe than secure in buses after dark, and women and older people are more likely to feel this." Neither study, however, assessed whether such perceptions actually led women to use buses less than men.

In some non-UK studies, women evaluate public transport more favourably than men do. Based on structured interviews with Norwegians, Hjorthol (2001, 37) concludes that "women have more positive attitudes toward public transport than men." However,

when participants had access to both car and public transport for commuting, gender did not predict willingness to spend extra time travelling to work by the latter mode ( $\beta = -.037$ ,  $p = .911$ ). While women may have been more positive than men about some aspects of public transport, they apparently thought it too slow and continued to drive.

Gärling *et. al.* (2000) found that women were more likely than men to report commuting by public transport, but because the study focused on determinants of willingness to reduce future car use rather than of past behaviour, it is not clear why. Matthies *et. al.* (2002) also found that women were more likely than men to report using public transport. In regressions with three different outcomes (intention to use public transport, preference for public transport and self-reported public transport use), gender's effect was lessened when 'ecological norms' and 'car habit' were entered as additional predictors. Gender had a significant ( $p < .05$ ) influence on each outcome before these variables were entered but its  $\beta$  value dropped in each model and became non-significant in two after 'ecological norm' and 'car habit' were added. This, Matthies *et. al.* suggest, illustrates that women expressed stronger preferences for public transport, stronger intentions to use it and reported higher actual use because they had stronger norms and weaker car habits than men.

Rather than examining gender differences in determinants of modal choice, Ellaway *et. al.* (2003) focused on psychological benefits gained by women and men from using different modes. (Of course, benefits may feed back, influencing future behaviour.) They found that, controlling for age and social class, "Men's self-esteem is more strongly related to car access than women's; on the other hand, for women, mastery was more closely related to car access, emphasising perhaps the practical rather than the symbolic importance of cars in women's lives" (Ibid., 228). Mastery is defined as "an individual's self perceived capacity to control events" and was measured by items asking, for example, whether people agreed that "I can do just about anything I set my mind to" (Ibid., 221). This echoes Bandura's (1997) conception of (general rather than behaviour-specific) self-efficacy. The psychological importance of such feelings extends far beyond travel. For example, Breakwell's (1993) identity process theory proposes that a general sense of "competence and control" is essential for a positive self-identity and avoidance of "feelings of futility, alienation and 'helplessness'" (Ibid., 205). These issues are revisited in Chapter 7. Here, it is simply noted that men and

women may perceive different benefits from driving and this could have implications for strategies intended to influence modal choice (see also Steg, 2005).

Leaving gender aside, Kuppam & Pendyala (2001) report that high earners in the US tend to combine more non-work activities with commuting and this may explain their particular unwillingness to use non-car modes. However, older people (who might be expected to earn more) reported combining fewer non-work activities with commuting. The reason may be that once children have left home, people perform fewer “out-of-home maintenance activities”, so their commutes are more direct (Ibid., 51). Nilsson & Küller (2000) report that young people drove less than the elderly, but middle-aged people drove the most. This can be seen as congruent with Kuppam & Pendyala’s (2001) findings, as the young and old may have fewer ‘out-of-home’ obligations.

Exley & Christie (2002) report various UK statistics on car and bus use by different groups. Seventy-nine percent of professionals drove a car at least twice a week, but only 9% used a bus this frequently. For those in routine/semi-routine jobs, the figures were 42% and 26%. Thirty-nine percent of people earning under £10,000 per year drove at least twice a week and 29% used a bus, while the figures for those earning between £18,000 and £32,000 per year were 75% and 10%. (Mean UK income was £25,170 in 2002/3; ONS, 2003.) These differences suggest that travel mode is related to occupation and income and that buses are “mainly used by those who are marginalised or ‘excluded’” (Exley & Christie, 2002, 11). Such people may not enjoy travel mode ‘choice’ at all. Indeed, Lucas, Grosvenor and Simpson (2001, v) – who examined links between travel and social exclusion through desk research and focus groups in the UK – argue that “economically- and socially-disadvantaged people do not travel less because they do not need to travel, but because they are often constrained from travelling in some way.” It would be useful to measure PBC alongside socio-demographics, modal preference and actual modal use. This may indicate whether less wealthy individuals want to drive but cannot, or voluntarily use non-car modes.

In Holland, Steg (2005) found that low earners rated affective aspects of driving more positively than high earners ( $F(2,177) = 8.8, p < .001$ ). She also reports that younger people gave significantly more favourable evaluations of affective aspects of driving than older respondents ( $F(1,176) = 9.9, p < .001$ ). Echoing this, Handy *et. al.* (2005)

found that some US interviewees said that they enjoyed driving for its own sake when they were younger, but enjoyment lessened with age.

To conclude, several studies have examined links between socio-demographics and travel. In the UK, the picture is of a public transport system that is particularly unattractive to women because of safety concerns. However, it is unclear whether these concerns actually stop women from using public transport. There is some evidence from continental Europe that women use public transport more than men because of stronger pro-environmental norms and weaker driving habits, but more work is required before these findings can be generalised. There are also gender differences (at least in one UK study) in terms of psychological benefits provided by cars. Driving seems to raise men's self-esteem more than women's, but women's sense of control more than men's.

Studies in various countries suggest that younger people and low earners enjoy driving more than older people and high earners, but the former groups still drive less, perhaps because of restricted car access. As yet, however, there does not seem to be much evidence linking socio-demographic characteristics and the extent of real modal 'choice'.

### 3.3.3 *Habits*

Stern (2000) suggests that habit influences many ESBs and travel is apparently among them. Bamberg & Schmidt (2003, 281) propose that while travel choices are "rooted in once made conscious considerations about pros and cons", behaviour often follows automatically from "situational cues". Several others make similar assertions (e.g. Fujii *et. al.*, 2001; Gatersleben & Uzzell, 2001).

Aarts & Dijksterhuis (2000, 76) – explaining the common conception in travel research – propose that habits are

strong associations between goals (e.g. going to the supermarket) and actions (e.g. using a bike). These associations develop as a result of frequent and consistent choices made to attain a certain goal (e.g. always use a bike to go to the supermarket). Because of these associations, the habitual choice or action is automatically activated upon activation of the relevant goal.

Klößner & Matthies (2004) examined this conception in their study of university travel. They measured habit by giving participants five activities (e.g. “shopping expedition”) and asking for the first travel mode that came to mind for each. These activities were assumed to be “so general and so reduced that... the decision can only be based on existing schema” (Ibid., 324). The strength of participants’ driving habit was rated by how many times they responded with ‘car’. This is called a ‘script-based’ measure, because people are given a behavioural script to respond to. The study also measured PN and SN relating to driving and assessed how these variables influenced self-reported car use for commuting. PN was the only significant predictor of commuting mode ( $\beta = .88, p < .001$ ) and the PN-behaviour correlation was moderate and significant for those with weak driving habits ( $r = .49, p < .001$ ), but weak and non-significant ( $r = .21, p > .05$ ) for those with strong driving habits. Thus, Klößner & Matthies suggest that trips to work are so frequent and routine that “the process of norm-activation is totally blocked if habit strength is high” (Ibid., 326). However, it seems more accurate to say that norms were activated, but that the PN-behaviour effect appeared to be blocked by habits.

While habit was not a direct predictor of behaviour in Klößner & Matthies’ (Ibid.) study, it was in Bamberg & Schmidt’s (2003). This is surprising because their participants were also German students and they investigated trips to university using a script-based measure. Bamberg & Schmidt tested a model comprising elements of Ajzen’s (1991) TPB, Schwartz’s (1977) NAT and Triandis’ (1977) TIB (which includes habit). Habit had a stronger influence on self-reported modal choice than any other predictor ( $\beta = .41, p < .05$ ).

Matthies *et. al.* (2002) tested a simpler model; consisting of PN, gender and habit (using a script-based measure) as predictors of self-reported car or subway use. Again, habit was a significant influence on modal choice ( $\beta = -.35, p < .001$ ) and had the highest  $\beta$  value of any predictor. Notably, however, PN had a stronger influence than habit when the regression outcome was willingness to reduce car use, rather than self-reported behaviour. Conscious processes like norm activation and intention formation can apparently occur despite habits, but habits can lessen the influence of these processes on behaviour (Aarts & Dijksterhuis, 2000; Staats, 2003). This supports the above interpretation of Klößner & Matthies’ (2004) results.

Based on their findings, Matthies *et. al.* (2002) suggest that improving public transport may not break driving habits because habitual drivers do not seek new information about alternatives. Given this, “it seems more promising to prevent people from becoming habitual car users in the first place” (Ibid., 173). If this can be done, norms, intentions and other conscious cognitions may have more influence on travel behaviour than if they must compete with opposing habits (Handy *et. al.*, 2005).

In conclusion, all of the studies reviewed used script-based measures of habit strength. This method is said to be better than using past behaviour as a proxy for habit because there is no guarantee that past behaviour was automatic (Klöckner & Matthies, 2004). Findings generally suggest that habit has a relatively strong influence on modal choice and can lessen the effects of conscious psychological motivations. It therefore seems useful to try to account for habits when explaining travel behaviour and perhaps especially commuting, as this is “an ideal example of a routine behaviour” (Ibid., 319).

### **3.4 Cautionary notes: desirability, dissonance and causation**

In many studies reviewed here, people were asked about their attitudes and beliefs and these data were used to explain variables such as modal choice or willingness to use different modes. Understanding of influences on travel behaviour is based largely on such work, but a review of the field must note certain methodological and conceptual issues that have a bearing on how we treat this understanding.

Firstly, in a behavioural domain such as personal transport – which some people see as having moral implications (see section 3.3.1.4) – social desirability may influence data. Although her study did not address the question directly, Steg (2005, 148f) suggests that “people might not be willing to admit that using a car fulfils many symbolic and affective functions... car drivers are inclined to justify and rationalise their behaviour.” Steg, Vlek & Slotegraaf (2001, 152) ask “Who would easily be aware and admit that driving a car contributes to one’s feelings of power and territorial instinct? People rather keep saying that it’s all a matter of time and money.” This study examined whether people gave different motives for car use under different circumstances. As reported in section 3.3.1.2, people stressed instrumental motives in a semantic-differential task. However, in a more opaque task where participants evaluated fictional car-use episodes, episodes that were deemed most attractive were typified by positive affect. People seemed to underplay the value of the car’s affective



functions and stress its instrumental functions when they were aware of what the researchers were trying to discover. They may not have wanted to give the impression of driving for 'trivial' affective reasons, but for more 'serious' practical reasons.

As well as being aware of how participants present themselves, we should recall the proposal that people strive for consistent internal self-image (Festinger, 1962). They may attempt to avoid cognitive dissonance: "discrepancy between attitudes or between attitudes and behavior" which creates "unpleasant psychological tension" (Tertoolen, Van Kreveld and Verstraten, 1998, 172). If drivers perceive their behaviour as environmentally damaging, they may experience dissonance. To relieve it, they can change their behaviour or attitudes. In Tertoolen *et. al.*'s study, people who scored high on AC before an intervention designed to reduce car use, but who did not reduce it, scored lower on AC afterwards. This suggests that when discrepancies between attitudes and behaviour are "pointed out, people are more likely to alter their attitude than their behavior, and tend to excuse themselves for their behavior" (Ibid.). Steg & Vlek (1997) report similar findings, with implications for attempts to reduce car use through information provision. Despite some (patchy) evidence that AC can motivate use of non-car modes, such motives may be vulnerable to change where people seek to avoid cognitive dissonance.

Thirdly, although most studies reviewed here assume that behaviour follows from attitudes, "Mode choice may also influence attitudes, through experience and psychological phenomena such as cognitive dissonance reduction" (Steg, Geurs & Ras, 2001, 791). Because travel psychology studies often measure attitudes and behaviour concurrently, we cannot be certain about causal direction (Bergström & Magnusson, 2003; Steg, 2003a). We must, therefore, acknowledge that the psychological motives detailed in section 3.3 may be expressed as *post hoc* justifications for behaviour, rather than prior explanations.

These observations have implications for travel psychology. Researchers should note that: 1) people may express particular attitudes because of social desirability concerns, 2) attitudes may change to reduce cognitive dissonance and 3) attitudes may follow from behaviour. Thus, efforts should be made to use methods that minimise socially desirable responses or at least help to identify them and researchers should not uncritically assume that data represent people's 'inner realities' (see Chapter 2). It

would also be useful to see more longitudinal studies that would enable greater certainty over causal direction.

### **3.5 Travel as a social dilemma**

The social dilemma concept is common in the literature reviewed here and helps to explain how factors discussed in section 3.3 influence travel behaviour. The idea of environmental problems as social dilemmas was proposed by Hardin (1968), who argued that consumption of a common resource by many individuals with unrestricted access to it eventually leads to the resource's exhaustion, with dire consequences for all. While it may appear rational to each person that they should consume as much and as quickly as possible – because their individual consumption is tiny – their combined consumption can rapidly destroy the resource, leaving everybody worse off. The dilemma is: consume while you still can, or show restraint and risk seeing the resource destroyed anyway.

In travel terms, the dilemma is usually seen as arising from tension between the (perceived) individual benefits of driving and its societal costs: pollution, congestion and accidents (e.g. Fujii *et. al.*, 2001; Nilsson & Küller, 2000). If one person tries to address these problems by not driving, they may suffer reduced utility while others continue to benefit from the car's convenience, flexibility and so on. However, if everyone stopped driving, the benefits to society would be large and in the long-term, everybody would be better off. As Nordlund & Garvill (2003, 340) note, "there is no objectively rational solution" because it can be seen as rational to serve one's individual interests or the collective interest.

Nordlund & Garvill (*Ibid.*, 339) assumed that willingness to reduce car use constitutes "intention to cooperate [in the dilemma] since it requires sacrificing immediate personal gains in order to reduce long-term collective environmental costs." (This may not always be so. Some participants in study 2 of this thesis appeared to derive immediate personal benefits from switching to non-car modes (see Chapter 6, section 6.5.1.2). But it may generally be *perceived* as true in car-oriented societies.) Based on a regression analysis, Nordlund & Garvill (*Ibid.*, 345) conclude that "holding a collective value orientation, such as self-transcendence [i.e. valuing others' welfare as well as one's own], and viewing the environment as worth preserving for its intrinsic value, is important for feeling morally obligated to cooperate". This echoes a necessary

condition for solving social dilemmas identified by Tertoolen *et. al.* (1998): that people must understand the problem “so that moral, normative and altruistic concerns as well as external pay-offs influence behavior” (Ibid., 172).

But research suggests that this condition may not pertain. Steg & Vlek (1997, 466) argue that AC is “an important prerequisite for creating public support for... measures aimed at reducing car use.” However, participants “evaluated their car use as ‘a (societal) problem’, but thought their own car use was ‘hardly a problem’ for society” (Ibid., 470). They argue that driving causes cognitive dissonance because individuals see car use as problematic, but still want to drive. In turn, dissonance leads people to revise their beliefs about how serious the problem is, rather than changing their behaviour. Evidence comes from the finding that people who had high AC scores before group discussions of transport issues actually had lower scores afterwards. As Salomon & Mokhtarian (1997, 107) remark, assuming that people will change their travel behaviour “so as to improve the environment may prove to be too optimistic. Very likely, individuals will respond in a manner which best suits them.” This does not necessarily mean that individuals act in a consciously selfish manner. There may be other processes at work. Breakwell (1986, 81) suggests that denial of a danger “is a well-documented response to stress... First, the facts are denied, then their relevance, then their urgency, then the need to act”. Perhaps people respond to threats like climate change, accidents and local pollution (see Chapter 1) by denying their seriousness and hence avoiding the psychological stress of engaging with them. This is no solution. Denial “is inevitably disadvantageous in the long run because it isolates the person from a reality which is unlikely to go away and may get progressively worse if ignored” (Ibid., 82). This could hardly be more apt to the problem of climate change.

Tertoolen *et. al.* (1998) also identify a second necessary condition for overcoming social dilemmas: people must believe that others will co-operate. If one does not believe this, why not exploit common resources since they will be destroyed anyway? Discouragingly, Gatersleben & Uzzell (2001) found that only 24% of their sample agreed that others would “voluntarily reduce their car use” and 7% agreed that “The local authority do everything they can” to tackle traffic-related problems. A later study (Gatersleben and Uzzell, 2003) found that only 13% of local policy-makers believed that residents would willingly drive less, although 81% of policy-makers believed that residents *could* do so. This issue is seldom examined in travel behaviour research, but

may be important. Perhaps pro-environmental motives (e.g. PN, concern over actions' consequences) will have maximum effect on behaviour when people believe that others will act pro-environmentally. This would be a useful area for future study.

Calhoun (2002) notes that sociologists have seen trust as "an essential element of stable social life" since Durkheim's (1964) *Division of Labor in Society* was published in the late 19<sup>th</sup> Century. Giddens (1990) argues that modern society undermines kinship and community ties and that trust has been eroded because individuals have little contact with many parties on whom their welfare depends. (We should note that Giddens is not talking about 'trust' relating to explicit promises, but to general confidence in others. In the context of this discussion, the interest is in people's confidence that others will reduce their car use.) Travel psychology (and other ESB research) may benefit from investigating such ideas.

Joireman *et. al.* (2004) have tried to advance the debate on social dilemmas by elaborating a temporal dimension. They argue that the conception of social dilemmas as conflicts between individual and collective interests is too simplistic, proposing that people who score high on consideration of future consequences (CFC) are less likely to drive than those who value immediate gains. They measured CFC using a 12-item scale asking whether various statements (e.g. "I consider how things might be in the future and try to influence those things with my day-to-day behavior") were characteristic of respondents ( $\alpha = .81$ ). The relationship between AC (four items,  $\alpha = .70$ ) and preference for public transport was significant for those with high CFC ( $\beta = .35$ ,  $t = 3.44$ ,  $p < .001$ ), but not for those with low CFC. Like Steg & Vlek's (1997) study, this shows that environmental awareness alone is often insufficient to motivate avoidance of driving, but it also suggests why this may be. AC might only influence travel behaviour when allied with a concern for long-term consequences. This is another issue deserving of research attention and taken alongside Giddens' (1990) ideas, it suggests that NAT and other models of altruistic behaviour (e.g. Stern, Dietz, Abel, Guagnano and Kalof's (1999) 'value-belief-norm' model) might be improved by addition of trust and CFC.

### **3.6 Car-use reduction measures and their acceptance**

Many travel psychology studies state an aim of policy-relevance; to inform strategies for addressing the problems described in Chapter 1 (e.g. Bergström & Magnusson,

2003; Gärling *et. al.*, 2000). Accordingly, several suggest car-use reduction measures based on their findings. This section reviews these measures, their rationales and their effectiveness.

Although it is relatively easy to measure behavioural interventions' success with willing participants, it is difficult in real-world situations. Marshall & Banister (2000) note that it is easier to see travel than 'non-travel'. Traffic volumes show how many journeys are made by car, but not how many people are using different modes or not travelling at all because some policy is in place.

Evaluation is not the only policy challenge. Intervention design also poses problems. Tertoolen *et. al.* (1998) argue that people may respond to being told not to drive by refusing to change their behaviour; asserting control over their own actions. Again we are reminded of the supposed importance of feelings of control to a positive self-identity (Breakwell, 1986; 1993). Indeed, as reported in section 3.4, Tertoolen *et. al.* (1998) found that people's stated AC actually lessened after they were given information on cars' environmental impacts. This, alongside the finding that there was no decrease in car use, suggests that people preferred to change their beliefs than to change their behaviour at somebody else's request. Moreover, people who received information on the financial costs of driving and who received both cost and environmental information did not reduce their car use. Given the failure of this "relatively intensive and personalized procedure", Tertoolen *et. al.* (*Ibid.*, 178) conclude that "even less effect may be expected from more superficial, generalized attempts to exert influence by means of mass-media campaigns" (see also Chapter 7, section 7.4).

Beyond Tertoolen *et. al.*'s work, the literature provides few examples of controlled tests of interventions designed to reduce car use. There are, however, *post hoc* assessments. Marshall & Banister (2000) reviewed eight schemes from three European countries, concluding that they "have had qualified success" (*Ibid.*, 321). Schemes included a park and ride bus service in Bristol (UK), a parking information system in Aalborg (Denmark), restricted car access to the centre of Enschede (Holland) and the introduction of teleworking across Holland. In one sense, the most successful scheme was the introduction of company bicycles by nine organisations in Aalborg. Thirty-five bicycles were ridden 21,700 km in six months. Just over 18,000 km replaced travel by motorised modes. This is a sizable shift, but the impact "on traffic in

the city as a whole was relatively small" (Ibid., 328). This illustrates a problem with targeted interventions. While they may meet individuals' needs more successfully than measures aimed at heterogeneous populations (Gatersleben, 2003), they only affect a few people's behaviour.

Steg (2003a) investigated acceptance of car-use reduction measures rather than their effectiveness. Focusing on transport pricing, she examined factors influencing acceptance of a policy package including higher fuel prices, tolls, closure of city centres to cars and inclusion of road tax in fuel costs. She also examined acceptance of higher fuel prices and tolling individually. Acceptance of the policy package, fuel price rises and tolling was influenced by awareness of driving-related problems (AC) ( $\beta = .28, .25$  and  $.18$ , respectively,  $p$  not reported for any results in this study). Attitudes (ATT) to car use were also influential ( $\beta = -.17, -.17$  and  $-.19$ , respectively), as were feelings of individual responsibility (AR) ( $\beta = .16, .10$  and  $.10$ , respectively). Outcome efficacy (whether people believed that their actions would make any difference to problems caused by travel) influenced acceptance of the policy package and tolling ( $\beta = .10$  and  $.10$ , respectively), while perceptions of others' travel behaviour only influenced acceptance of the policy package ( $\beta = .08$ ). There is conceptual overlap between outcome efficacy and confidence in others (see section 3.5). People may be more likely to believe that their actions will make a difference if they also trust others to act for the same ends. Confidence in others may even influence the feelings of personal responsibility captured by AR. Outcome efficacy should also be distinguished from perceived self-efficacy (see section 3.3.1.6). PSE refers to people's beliefs about whether they can perform an action, rather than about the action's outcomes.

In another study, Steg & Vlek (1997) found positive relationships between AC, AR, outcome efficacy and evaluations of the effectiveness and acceptability of 'push' (coercive) and 'pull' (non-coercive) car-use reduction policies. However, they note that when policies were perceived as being effective, they were also often perceived as unacceptable because they would impinge on individuals' ability to drive freely. This hints at the value placed on personal freedom in modern Western societies and its role as a barrier to reduced car use; an issue explored in Chapter 7.

Although these results suggest attitudes that may be necessary for acceptance of car-use reduction policies, they do not show how people will behave if those policies are



enacted. Indeed, Steg (2003a) notes that transport pricing could have unwanted side-effects. It may lessen psychological motivations for reducing car use if people believe that contextual factors are achieving this goal anyway. Thus, if prices fell, people would resume their old behaviours. Furthermore, people may perceive a right to drive because they are paying more to do so.

Despite these dangers, travel psychologists and others continue to suggest interventions designed to cut car use either by switching modes or removing the need to travel altogether (e.g. Foley & Fergusson, 2003; SISTech, 2004). The problems described in Chapter 1 make these efforts necessary, despite the challenges. The introduction of congestion charging in London in 2003 (see *Figure 3.2*) led to 30% fewer cars entering the zone in the first six months of operation (TFL, 2003). This suggests that large-scale car-use reduction measures can work, but they should, of course, take account of relevant psychological research. For example, media coverage of UK government plans for 'pay-per-mile' car tax contained many references to the need for public acceptance (e.g. Tempest, 2005). It is just this sort of issue to which travel psychology could usefully contribute.



*Figure 3.2* Congestion charging in London

### 3.7 Conclusions

This chapter has reviewed research on factors influencing modal choice, whether people travel at all, whether they accept car-use reduction policies and what impact such policies might have. Taking Stern's (2000) assessment of progress toward a coherent theory of ESB as its framework, the review examined psychological factors, context/personal capabilities and habits. These categories provided a starting point, but it has been argued that they overlap and that Stern's 'attitudinal factors' can be differentiated into several separate – although often related – psychological influences.

Several studies which measure instrumental evaluations show that cars are seen as conferring utility (e.g. Hagman, 2003). However, as users of different modes share this view, it may not explain modal choice. Perceptions of cars' environmental (dis)utility could be more useful, with the likelihood of driving decreasing as the weight given to its perceived negative environmental impacts increases (Anable & Gatersleben, 2005).

This is one area of overlap between Stern's (2000) 'attitudinal factors'. While some studies treat environmental impact as an instrumental disbenefit of travel, others use Schwartz's (1977) awareness of consequences construct to place beliefs about impacts at the start of a causal chain running via personal norms to behaviour. There is evidence that PN mediates the AC-behaviour relationship (e.g. Nordlund & Garvill, 2003) and the PN-modal choice effect is reliable (e.g. Klöckner & Matthies, 2004). There is less evidence concerning feelings of responsibility (AR). It is important to clarify how (and if) these variables interact, as attempts to promote pro-environmental behaviour often rely on information provision alone and poor results may stem from paying insufficient attention to AR and PN (Collins *et. al.*, 2003).

These are all components of Schwartz's (1977) NAT and work on travel as a social dilemma highlights two ways in which this theory of altruistic behaviour might be developed. Consideration of future consequences may be a useful addition (Joireman *et. al.*, 2004), as might some measure of trust. AR and PN may have most effect on behaviour when accompanied by trust in others to co-operate in social dilemmas (e.g. by avoiding car use themselves).

Although NAT apparently captures some important influences on modal choice, it ignores others. Instrumental evaluations are one, echoing the attitude (ATT) construct



from Ajzen's (1991a) TPB. Subjective norm is another TPB construct that has received considerable attention, but its effect is unreliable. This may be because PN partially accounts for SN (Harland *et. al.*, 1999; Schwartz, 1977) and/or because peer pressure is stronger in some social settings than others (Bamberg & Schmidt, 2003). Moreover, most studies measure injunctive norms but not descriptive norms. Future research could usefully investigate whether perceptions of others' behaviour, as well as of their expectations, affect travel behaviour.

Social effects on travel are not restricted to those captured by SN. There is also evidence of social-symbolic influences. It has been shown that driving confers greater status than public transport (Ellaway *et. al.*, 2003), that drivers value status more than non-drivers and that modal choice serves to present an image of the self (Steg, 2005).

Here we see another overlap between influences, as symbolic factors can be seen as affective (e.g. Steg, Vlek & Slotegraaf, 2001). But there are other affective aspects to travel. Experiences of pleasure, stress, control, excitement and privacy have all been identified as influences. Steg, Vlek & Slotegraaf (*ibid.*) suggest that drivers may be more reluctant to express affective motives for their modal choice than non-drivers. Thus, while affect seemingly does influence travel behaviour, measurement methods that minimise social-desirability bias are required. Consistent definitions are also needed and it was suggested in section 3.3.1.2 that studies could distinguish affective experiences (e.g. pleasure) from their causes (e.g. privacy).

Another 'attitudinal factor' – perceived behavioural control – may affect the extent to which any of the above influences actually directs travel behaviour. Studies often report that people feel low control over their modal choice (e.g. DfT, 2003). The distinction between PBC and context is blurry, as many contextual conditions must be interpreted and the extent to which any is seen as an incentive or a barrier to using a particular mode probably depends on the strength of other motives (Salomon & Mokhtarian, 1997). For example, somebody who enjoys walking may be willing to endure worse weather than somebody who does not share this affective motivation.

Social environments (e.g. job requirements) have also been shown to influence travel (e.g. Nankervis, 1999). There is overlap here between context and SN: an 'attitudinal factor'. People's socio-demographic characteristics can also be seen as a type of

contextual influence. There is evidence (at least from the UK) that use of different travel modes is related to socio-economic position. Low earners and non-professionals are less likely to drive and more likely to use public transport (e.g. Exley & Christie, 2002). As well as income/occupation, studies have examined gender's relationship with travel. A number of authors suggest that women in the UK have safety concerns about public transport (e.g. Ellaway *et. al.*, 2003), but there is little evidence of such concerns keeping women off buses or trains. Indeed, UK women use buses more than men (DfT, 2003a). This is also true in other European countries, but here there is evidence of women having more pro-public transport attitudes than men (e.g. Hjorthol, 2001).

Habits were the final influence covered by the review and there is good evidence of their effect on travel behaviour (e.g. Bamberg & Schmidt, 2003). Klöckner & Matthies (2004) showed that even when pro-environmental motives for avoiding car use (e.g. PN) are present, an opposing habit can block any effect on behaviour. Matthies *et. al.* (2002) suggest that car-use reduction measures should aim to prevent people from becoming habitual drivers in the first place.

Such measures were examined in section 3.6. There are reports of small-scale successes with fairly resource-intensive schemes (Marshall & Banister, 2000), but information alone does not seem motivate reduced car use (Tertoolen *et. al.*, 1998). The review suggests several reasons for this. First, awareness of consequences (AC) seems to have little effect on behaviour in the absence of feelings of obligation (PN). Second, even AC and PN may be insufficient without concern for the future (Joireman *et. al.*, 2004). Third people may need to trust others to act before acting themselves (Gatersleben & Uzzell, 2003). Fourth, if people value cars' instrumental or affective functions, self-interest may lead them to ignore information about driving's negative impacts. Fifth, if people perceive no choice but to drive, information about its consequences is unlikely influence their behaviour. Finally, where driving is habitual, habits can override even PN, so information alone seems likely to have little effect.

It is striking that many influences on travel uncovered by this review are captured by Ajzen's (1991; 1991a) TPB and Schwartz's (1977) NAT. Even when these models are not applied in full, their constructs are often used – with some success – to explain modal choice and/or policy acceptance. Of course, these theories do not capture every relevant influence, but it seems that as with many other environmentally-significant

behaviours, NAT and the TPB can help us to understand why people use particular modes and make (or avoid) particular journeys.

This chapter has also suggested links between theories commonly applied in travel psychology and theories from other domains. For example, the importance of feelings of control to a positive self-image is highlighted by Breakwell's (1993) identity process theory and is echoed by PBC, while Gatersleben & Uzzell's (2001; 2003) work calls to mind Giddens' (1990) sociological ideas on trust. Such issues are revisited in the general discussion in Chapter 7. The next chapter, however, focuses on two theories that are not only common in travel psychology, but have come to dominate ESB research more generally; Ajzen's (1991; 1991a) TPB and Schwartz's (1977) NAT. Given that travel is a type of ESB, it is useful to examine research on other behaviours in this domain and to consider how it might inform the study of travel behaviour.

## **Chapter 4**

# **Literature review 2: norm-activation and theory of planned behaviour research on environmentally-significant behaviour**

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### **4.1 Introduction: rationale for the review**

As observed in Chapter 3, travel psychology studies often apply one of two attitude-behaviour theories: Schwartz's (1977) norm-activation theory (NAT) and Ajzen's (1991; 1991a) theory of planned behaviour (TPB). Not only are they common in travel psychology, they are the "two classic psychological models which have been applied" to environmentally-significant behaviour (ESB) more generally (Matthies, 2003, 104). A literature search undertaken for this chapter demonstrates this (see section 4.3.1).

This chapter reviews 24 empirical studies of ESB's determinants that use NAT and/or the TPB. The review had two broad aims. One was to establish which (if either) theory best explains ESB. To answer this general question, three more specific questions were asked.

- Are there contexts in which one theory is more applicable than the other?
- Are their behaviours to which one theory is more applicable than the other?
- What are the reasons for one theory's superior applicability if such a judgement can be made?

These questions suggest a traditional literature review like Chapter 3's; a theory-level overview of research in a behavioural domain. However, the review's second aim required an additional micro-level approach, focusing on individual constructs. This aim was to assess "the frequency with which studies in the research literature support (or refute) a particular finding" (Wood, 2000, 417). Many studies may show that *X* influences *Y*, but it is important to know whether researchers mean the same things by *X* and *Y* and, therefore, whether studies purportedly "addressing the same relationship" (Hines, Hungerford and Tomera, 1987, 2) actually do so. Findings from the micro-level analysis informed the operational definitions used in the studies presented in Chapters

5 and 6 and this chapter as a whole illuminates several methodological issues, consideration of which was useful preparation for empirical work.

#### 4.1.1 *Balancing consistency and innovation in research*

Chapter 3 showed that some influences on travel behaviour generalise well (e.g. personal norms, habits). Research has brought cumulative understanding, strengthening the case for saying that particular factors influence travel behaviour through successive additions to the literature. Ziman (1991, 3) describes this process.

Scientific knowledge is the product of a collective human enterprise to which scientists make individual contributions which are purified and extended by mutual criticism and intellectual cooperation... the goal of science is a consensus of rational opinion over the widest possible field.

Ziman's position has two notable implications. First, it assumes that we advance towards 'truth' by 'purifying' and 'extending' lines of enquiry. The same assumption is made by studies in the attitude-behaviour tradition, within which most work reviewed in Chapter 3 and all work reviewed in this chapter is positioned. Second, it suggests that some consistency in research is desirable. Unless studies develop previous work, we will not reach consensus in fields like travel behaviour, let alone 'the widest possible field' (see Oom Do Valle, Rebelo, Reis and Menezes, 2005; Stern, 2000).

These are complex issues. Philosophers (e.g. Chalmers, 1999) and social scientists (e.g. Parker, 1998) have debated epistemology at length, yet arguments between relativists and realists (among others) persist. As for research consistency, it is arguable that there is a balance to be struck that avoids endlessly re-testing identical models and testing models that are incomparable.

The epistemological position taken in this thesis is explained in Chapter 2, but more important for this chapter's purpose is to recognise epistemological assumptions in the reviewed work. As noted, attitude-behaviour research is non-relativist, assuming the existence of discoverable psychological characteristics that are "long-lived and... relate to behaviour in a systematic manner" (Breakwell, 1993, 209). Every study reviewed here makes this assumption.

It is necessary to say a little more about research consistency. The proposal is that a 'coherent theory of environmentally-significant behaviour' (Stern, 2000) can only develop if there is reasonable consistency in theories, models and constructs' definitions. What is 'reasonable' is debatable. Some variation in operational definitions can enhance generalisability, showing whether a construct is robust to different measurement methods. But excessive variation – where nominally-identical constructs have substantively different content – may cause confusion over which relationships hold across situations. We must also acknowledge that theories are not immutable. They are subject to change as our understanding develops. But this process should be guided by existing findings and/or theory rather than being entirely speculative (Oom Do Valle *et. al.*, 2005).

## **4.2 Definitions**

Section 4.1 introduced three important terms: theory, model and construct. According to the *Oxford Dictionary of Psychology*, a theory is "a set of propositions offered as a conjectured explanation for an observed phenomenon" (Colman, 2001, 739). A model is "a deliberately simplified and usually idealized and imaginary representation of a phenomenon, with fundamental properties that are explicitly defined... from which other properties can be deduced by logical reasoning" (Ibid., 457). A construct is "a conjectured entity, process, or event that is not observed directly but is assumed to explain an observable phenomenon" (Ibid., 349). Thus, a model articulates a theory, showing how the components of an explanation for some phenomenon (e.g. travel behaviour) interact. In psychological theories, these components are often constructs such as attitudes and beliefs which are intangible, but assumed to be measurable with appropriate instruments such as survey items.

## **4.3 Method**

### **4.3.1 Review material**

As this review was concerned with cumulative understanding of ESB, it was decided to focus on the theory (or theories) that is (or are) most common in the domain. Matthies' (2003) comments (see section 4.1) and Chapter 3's findings suggested that these may be NAT and the TPB, but a literature search was needed to establish this.

The Social Sciences Citation Index (SSCI, 2005) and Zetoc (2005) databases were searched for "environment AND behaviour/behavior". One-hundred and eighty-one

post-1980, English language publications concerning individuals' ESB were identified. Inclusion of only English language publications is an acknowledged limitation. Abstracts revealed that NAT and the TPB were indeed the two most commonly applied theories in Colman's (2001) well-defined sense.

Although ESB research uses several approaches, including social dilemmas (e.g. Fujii *et. al.*, 2001), the new environmental paradigm (NEP) (Dunlap & Van Liere, 1978) and Kaiser's (1998) general measure of ecological behaviour, many are not theories. They are perspectives or measurement instruments that do not necessarily advance a 'coherent theory' of ESB. For example, while various studies use the NEP to measure "environmental attitudes or concern" (Olli, Grendstad and Wollebaek, 2001, 186), they sometimes have contradictory theoretical implications. Stern *et. al.* (1999) found that acceptance of the NEP explained beliefs about specific behavioural consequences captured by NAT's awareness of consequences (AC) construct, while Widegren (1998) used NEP items to measure AC. Moreover, Stern *et. al.* (1999) placed NEP as consequent to values and antecedent to the constructs specified by Schwartz's (1977) NAT, while Widegren (1998) placed it as antecedent to guilt over not acting pro-environmentally and consequent to socio-demographics. Comparing these studies arguably serves to confuse more than clarify ESB's determinants.

There are also well-defined theories – such as Triandis' (1977) theory of interpersonal behaviour (TIB) – that are applied infrequently to ESB. Although common in other domains (e.g. Kingston, Evans, Smith and Berry, 2004 in the context of medical practice), they have not contributed to cumulative understanding of ESB to the same extent as NAT or the TPB.

Using the criterion that a study must measure at least two constructs from one of the focal theories for inclusion in the review, SSCI and Zetoc provided eight TPB studies, seven NAT studies and seven that used constructs from both theories (including at least two TPB or NAT constructs). Searches on the theories' names did not identify other relevant literature, nor did Ajzen's website (Ajzen, 2005). One known TPB study not contained in the databases was added to the review material (Steg & Uneken, 2002), as was a study using constructs from both theories (Von Borgstede and Biel, 2002), resulting in a list of 24 publications (*Table 4.1*). This may seem few, but many studies – even some claiming to apply NAT or the TPB – actually only measure a

Theory	Study	Publication	Behaviour or intention	All items listed	Scale reliabilities reported	All p values reported
TPB	Bang <i>et. al.</i> (2000)	<i>Psychology and Marketing</i>	Purchasing renewable energy for the home	✓	✓	✓
	Boldero (1995)	<i>Journal of Applied Social Psychology</i>	Household recycling	✓	✓	✓
	Cheung <i>et. al.</i> (1999)	<i>Environment and Behavior</i>	Household recycling	✓	✓	✓
	Dahab <i>et. al.</i> (1995)	<i>Advances in Consumer Research</i>	Household recycling	X	✓	✓
	Ewing (2001)	<i>Environment and Behavior</i>	Household recycling	✓	✓	✓
	Kalafatis <i>et. al.</i> (1999)	<i>Journal of Consumer marketing</i>	Buying 'green' products (e.g. furniture from sustainably-managed wood sources)	X	✓	✓
	Steg & Uneken (2002)	<i>ICTTP conference proceedings</i>	Travel mode choice	✓	✓	X
	Steg (2005)	<i>Transportation Research Part A</i>	Travel mode choice	✓	✓	✓
NAT	Taylor & Todd (1995)	<i>Environment and Behavior</i>	Household recycling and composting	✓	✓	✓
	Black <i>et. al.</i> (1985)	<i>Journal of Applied Psychology</i>	Improving home energy-efficiency	X	✓	X
	Guagnano <i>et. al.</i> (1995)	<i>Environment and Behavior</i>	Household recycling	✓	✓	✓
	Nordlund & Garvill (2002)	<i>Environment and Behavior</i>	General pro-environmental behaviour	X	✓	✓
	Nordlund & Garvill (2003)	<i>Journal of Environmental Psychology</i>	Reducing car use	✓	✓	✓
	Stern <i>et. al.</i> (1999)	<i>Human Ecology Review</i>	General pro-environmental behaviour	✓	✓	X
	Stern <i>et. al.</i> (1986)	<i>Population and Environment</i>	Pressuring government and industry for environmental action	✓	✓	✓
Both theories	Bamberg & Schmidt (2003)	<i>Environment and Behavior</i>	Travel mode choice	✓	✓	✓
	Barr <i>et. al.</i> (2005)	<i>Energy Policy</i>	General pro-environmental behaviour	✓	✓	✓
	Bratt (1999)	<i>Environment and Behavior</i>	Household recycling	✓	✓	✓
	Flannery & May (2000)	<i>Academy of Management Journal</i>	Pro-environmental decision-making at work	✓	X	✓
	Harland <i>et. al.</i> (1999)	<i>Journal of Applied Social Psychology</i>	Using unbleached paper, reducing meat consumption, using non-car modes, using energy-saving lights, conserving water	✓	✓	✓
	Hunecke <i>et. al.</i> (2001)	<i>Environment and Behavior</i>	Travel mode choice	✓	✓	✓
	Oom Do Valle <i>et. al.</i> (2005)	<i>Environment and Behavior</i>	Household recycling	✓	✓	✓
	Tanner (1999)	<i>Journal of Environmental Psychology</i>	Travel mode choice	X	X	✓
	Von Borgstede & Biel (2002)	<i>Göteborg Psychological Reports</i>	Copying double-sided, recycling paper, turning off computer screen when not in use, using phone instead of meetings, incorporating environmental issues in teaching and research	✓	X	✓
	Percentage of studies reporting each type of information			79%	88%	88%
	Percentage of studies reporting all three types of information				63%	

Table 4.1 Studies included in the review (plus their reporting of items, scale reliabilities and p values)



single construct from one or both theories (e.g. Widegren, 1998). Although interesting in terms of operational definitions, such studies were not reviewed because they do not systematically test the focal theories' structures. It is also notable that not all studies included in the review actually claimed to apply one of the theories, even when they measured at least two NAT and/or TPB constructs (e.g. Steg & Uneken, 2002).

As well as listing each study reviewed, the publication it appeared in and the type of ESB it focused on, *Table 4.1* shows whether studies reported particular types of information. This issue is taken up in section 4.5.4. The table also highlights travel studies (shown in bold type). Like this thesis, four of the seven travel studies used both NAT and the TPB. However, unlike any of the reviewed research, this thesis used a mixed-method approach involving quantitative and qualitative work (Chapters 5 and 6, respectively).

#### *4.3.2 Analytical approach*

NAT and the TPB's applicability to ESB was examined using the theory-level questions listed in section 4.1. These are addressed in section 4.6. The micro-level analysis focused on individual constructs. The NAT constructs are awareness of consequences (AC), responsibility denial (RD) and personal norm (PN) (Schwartz, 1977). The TPB constructs are behavioural intention (BI), attitude towards the behaviour (ATT), perceived behavioural control (PBC) and subjective norm (SN) (Ajzen, 1991a). Concerning each construct in each relevant publication, three questions were asked.

- Does the theoretical definition differ from the original?
- Does the operational definition differ from the original?
- How do definitional variations affect results?

Three further questions were addressed by taking a view across the literature.

- How varied are theoretical definitions of each construct?
- How varied are operational definitions of each construct?
- How varied is each construct's role in theoretical structure?

Through these questions, the review assessed how consistently the theories have been applied and the extent to which published studies provide a cumulative

understanding of NAT and the TPB's ability to explain ESB. A summary of findings is presented in section 4.5.1 and full findings in sections 4.5.2 to 4.5.4.

**4.4 NAT and the TPB**

Having explained the review's aims, scope and method, it is necessary to describe in detail the theories on which this chapter focuses and which inform much of this thesis.

Ajzen's (1991; 1991a) TPB has been applied to many ESBs and other behaviours (Armitage and Conner, 2001). It proposes BI as behaviour's immediate psychological antecedent. BI is determined by a person's overall evaluation of a behaviour (ATT), perceived social pressure surrounding it (SN) and perceived control over influences that may facilitate or inhibit performance (PBC). These constructs are based on underlying beliefs. For example, SN rests on beliefs about the wishes of others and the individual's motivation to comply with them. Arrow '1' in *Figure 4.1* indicates that where PBC accurately reflects factors affecting control, it may directly influence behaviour (Ajzen, 1991a). Arrow '2' indicates that PBC may moderate the BI-behaviour relationship (Ibid.; Ajzen, 2002). Moderators were briefly mentioned when defining mediators in Chapter 3, section 3.3.1.5. To explain further, a moderator "is a third variable that affects the zero-order correlation between two other variables" (Baron & Kenny, 1986, 1174) and specifies "when certain effects will hold" (Ibid., 1176). Ajzen's proposal is that the BI-behaviour relationship should be stronger for people with high PBC than for those with low PBC. PBC differentiates the TPB from its predecessor, the theory of reasoned action (TRA) (Ajzen & Fishbein, 1980).

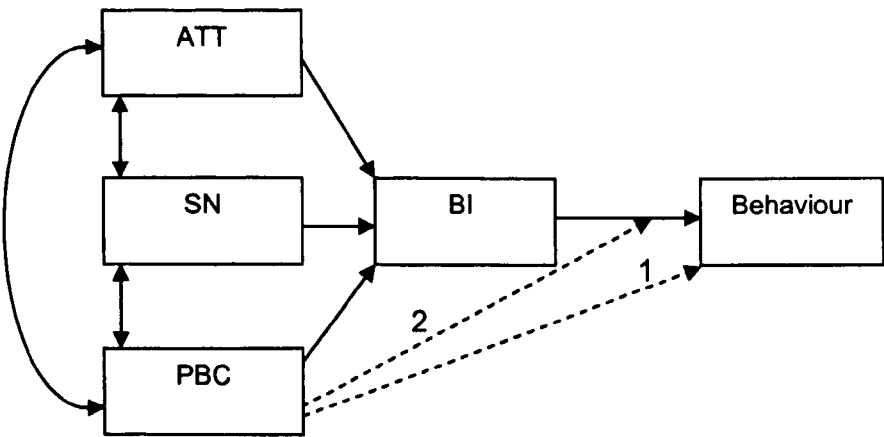


Figure 4.1 Ajzen's (1991a) TPB

Schwartz's (1977) NAT was developed to explain altruistic behaviour intended "to benefit another as an expression of internal values, without regard for... social and material reinforcements" (Ibid., 222). While Schwartz emphasised the value placed on other people, ESB research emphasises "whatever objects are the focus of the values that underlie the norm" (Stern *et. al.*, 1999, 83), assuming that these can include non-humans. Normative self-expectations (PN) are the immediate antecedent of altruistic acts and are activated by AC and feelings of responsibility. Schwartz (1977) spoke of a tendency for responsibility denial (RD), but – as shown in section 4.5.3.2 – subsequent researchers have used the behaviour-specific AR construct. Many NAT variants have been applied to ESB, but are linked by Schwartz's general propositions. Schwartz (1977) also said that PN's influence on behaviour is moderated by AC and responsibility, but few ESB studies (e.g. Bamberg & Schmidt, 2003) test these effects.

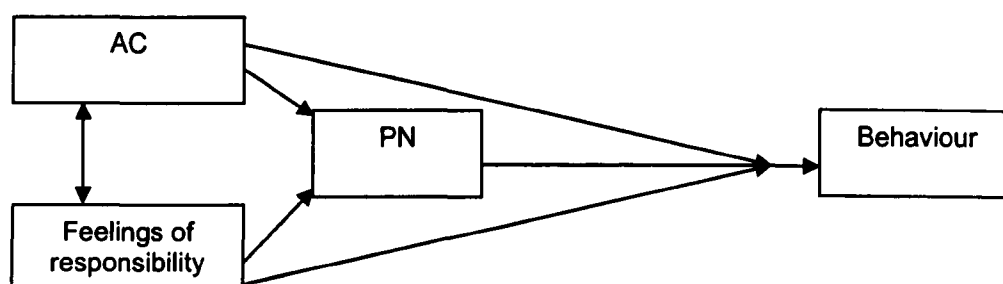


Figure 4.2 Schwartz's (1977) NAT

Differences between NAT and the TPB include, firstly, the former's emphasis on altruism. Benefits to others are prioritised over self-interest. The TPB, however, stresses personal utility. Although ATT *may* capture beliefs that a behaviour is positive because it benefits others, these are not assumed to be necessary for action. Second, NAT focuses on internal normative influences (PN), while the TPB focuses on external ones (SN). Third, the TPB captures perceived control over behaviour (and, by implication, perceptions of context), but NAT does not. Fourth, the TPB includes the behavioural intention (BI) construct, while NAT does not. Due to the theories' different explanations of ESB, some researchers have developed models incorporating constructs from each. For example, PN has been added to the TPB (e.g. Flannery and May, 2000) and SN (e.g. Bratt, 1999) and PBC (e.g. Tanner, 1999) added to NAT.

## 4.5 Results

### 4.5.1 Summary

Micro-level results are presented construct-by-construct, starting with those from the TPB. They are summarised in *Table 4.2*, which uses five categories: *none*, *low*, *moderate*, *high* and *complete*. Depending on the column in which they appear, these categories indicate:

- correspondence between definitions of NAT and TPB constructs in ESB studies and the constructs' original definitions,
- correspondence between a construct's theoretical role in ESB studies and its original role,
- consistency in a construct's definitions and roles across ESB studies, regardless of how it was first defined or applied.

The categories are based on the percentage of relevant studies (those providing theoretical/operational definitions of a construct) that agree on a construct's definition or role. *None* = 0%, *low* = 1% to 33%, *moderate* = 34% to 66%, *high* = 67% to 99%, *complete* = 100%. Decision rules for entries in *Table 4.2* were as follows.

- For the columns 'Correspondence with Schwartz/Ajzen's theoretical definition' and 'Correspondence with Schwartz/Ajzen's operational definition'

$$\% \text{ correspondence} = \left[ \frac{100}{\text{total theoretical/operational definitions}} \right] \times \begin{array}{l} \text{theoretical/operational} \\ \text{definitions substantively} \\ \text{the same as Schwartz} \\ \text{(1977) or Ajzen (1991;} \\ \text{1991a)} \end{array}$$

- For the column 'Correspondence with original role in theory'

$$\% \text{ correspondence} = \left[ \frac{100}{\text{instances in which construct influences and is influenced by variables postulated by Schwartz (1977) or Ajzen (1991; 1991a) and no other variables}} \right] \times \begin{array}{l} \text{instances in which} \\ \text{construct influences or is} \\ \text{influenced by variables} \\ \text{not postulated by} \\ \text{Schwartz (1977) or Ajzen} \\ \text{(1991; 1991a) or does} \\ \text{not influence or is not} \\ \text{influenced by variables} \\ \text{postulated by Schwartz} \\ \text{(1977) or Ajzen (1991;} \\ \text{1991a)} \end{array}$$

- For the column 'Consistency across ESB studies'

$$\% \text{ consistency} = \left( \frac{100}{\text{instances in which construct is theoretically/operationally defined}} \right) \times \text{maximum number of instances using substantively the same theoretical/operational definition}$$

All percentages in *Table 4.2* are rounded to the nearest whole number. To illustrate application of the decision rules, take PN's 'Correspondence with Schwartz/Ajzen's theoretical definition'. Thirteen theoretical definitions of PN were reviewed. Eleven were substantively the same as Schwartz's (1977); feelings of personal moral obligation for a specific act (see section 4.5.3.1).  $(100/13) \times 11 = 85\%$ . Eighty-five percent is in the *high* category, hence the cell entry. Similarly, take AC's 'Consistency across ESB studies'. The *moderate* entry for consistency of operational definitions is based on there being 10 such definitions; six action-focused and four condition-focused (see section 4.5.3.3). Therefore, the maximum number of instances where substantively the same operational definition appeared was six.  $(100/10) \times 6 = 60\%$ .

Following the sub-sections covering each construct, there are some comments on how results are reported in the reviewed studies (section 4.5.4). *Table 4.1* shows whether studies provide all scale reliabilities, questionnaire items and *p* values. These are basics of quantitative research reporting (Wright, 2003), providing information that is essential in interpreting results.

## 4.5.2 Results for TPB constructs

### 4.5.2.1 Behavioural intention (BI)

- Theoretical definitions

BI, as theoretically defined by Ajzen (1991a, 181), captures "the motivational factors that influence a behavior". Although no reviewed study uses the term 'motivational factors', all seven definitions reflect this conception by stating that BI derives from the motives captured by ATT, PBC and SN (Bamberg & Schmidt, 2003; Bang, Ellinger, Hadjimarcou and Traichal, 2000; Boldero, 1995; Cheung, Chan and Wong, 1999; Dahab, Gentry and Su, 1995; Harland *et. al.*, 1999; Steg, 2005).

Construct (and theory)	<i>n</i> theoretical definitions reviewed	<i>n</i> operational definitions reviewed	Correspondence with Schwartz/Ajzen's theoretical definition	Correspondence with Schwartz/Ajzen's operational definition	Correspondence with original role in theory	Consistency across ESB studies
BI (TPB)	7	8	<b>Complete.</b> All 7 definitions define BI as resulting from ATT, PBC and SN, echoing Ajzen's (1991a, 181) "motivational factors".	<b>Moderate.</b> 4 of 8 studies tap only strength of intentions for specified acts (Ajzen, 1991).	<b>Complete.</b> BI is always behaviour's immediate antecedent.	Theoretical – <b>complete</b> (100%) Operational – <b>moderate</b> (50%) Role – <b>complete</b> (100%)
ATT (TPB)	12	13	<b>Moderate.</b> 5 echo Ajzen (1991a), referring to overall evaluations of behaviour. 9 define ATT as product of behavioural and outcome beliefs.	<b>Moderate.</b> 8 of 13 studies use semantic-differentials to assess overall evaluation of individual's behaviour.	<b>High.</b> 11 studies treat ATT as predictor of BI. 1 as direct predictor of behaviour.	Theoretical – <b>high</b> (75%) Operational – <b>high</b> (67%) Role – <b>high</b> (92%)
PBC (TPB)	7	11	<b>Low.</b> 2 of 7 studies refer to "ease or difficulty" of behaviour (Ajzen, 1991a, 183).	<b>N.A.</b> Ajzen (2002) suggests that PBC can be appropriately operationalised in various ways.	<b>Low.</b> 9 of 11 studies treat PBC as predictor of BI and 6 as predictor of behaviour, but only 3 test moderating effect on BI-behaviour.	Theoretical – <b>high</b> (83%) Operational – <b>low</b> (27%) Role – <b>low</b> (27%)
SN (TPB)	16	16	<b>Complete.</b> All definitions cite perceived social pressure surrounding specific acts, despite variations in phrasing (Ajzen, 1991a).	<b>High.</b> 12 of 16 studies specify "important" others (Ajzen, 1991a) or other potentially salient referents.	<b>Moderate.</b> 10 of 16 studies treat SN as predictor of BI. 5 as predictor of behaviour and 2 as predictor of PN.	Theoretical – <b>complete</b> (100%) Operational – <b>high</b> (75%) Role – <b>moderate</b> (63%)
PN (NAT)	13	13	<b>High.</b> 11 of 13 echo Schwartz (1977), referring to behaviour-specific personal obligation.	<b>Moderate.</b> 5 of 13 studies follow Schwartz (1977), tapping only behaviour-specific personal obligation.	<b>Moderate.</b> 8 of 13 studies treat PN as predictor of behaviour. 5 treat it as predictor of BI.	Theoretical – <b>high</b> (85%) Operational – <b>moderate</b> (38%) Role – <b>moderate</b> (62%)
AR (NAT)	8	6	<b>None.</b> No studies define AR as a trait (Schwartz, 1977).	<b>None.</b> No studies measure AR as a trait (Schwartz, 1977).	<b>Low.</b> 4 of 6 studies treat AR as predictor of PN, following Schwartz (1977), but only 1 tests AR as moderator of PN-behaviour.	Theoretical – <b>high</b> (88%) Operational – <b>low</b> (33%) Role – <b>high</b> (67%)
AC (NAT)	11	10	<b>None.</b> No studies define AC as a trait (Schwartz, 1977).	<b>None.</b> No studies measure AC as a trait (Schwartz, 1977).	<b>Low.</b> 9 studies test AC-PN effects, 1 tests AC-behaviour effect and 1 tests AC-BI effect. 2 test AC as moderator of PN-behaviour.	Theoretical – <b>moderate</b> (60%) Operational – <b>moderate</b> (40%) Role – <b>high</b> (90%)

Table 4.2 Micro-level (construct) results summary

- Operational definitions

Ajzen & Fishbein (1980) originally operationalised BI using items rating strength of intentions for specific acts. Four of eight studies that measure intention tap solely this conception (Bamberg & Schmidt, 2003; Boldero, 1995; Dahab *et. al.*, 1995; Harland *et. al.*, 1999). Others tap three further dimensions (substantively different psychological factors). These are desires (what people 'want to' do) (Cheung *et. al.*, 1999), self-predictions (what people 'will' do) (Ibid.; Flannery & May, 2000; Taylor and Todd, 1995) and "willingness to" perform a behaviour (Bang *et. al.*, 2000). Overall, there is moderate correspondence between operational definitions of intention in ESB studies and Ajzen & Fishbein's (1980) original operational definition and there is moderate consistency across ESB studies.

- Results

TPB research often does not measure behaviour, instead using BI as the outcome variable. However, two recycling studies show BI explaining 80.1% of variance in self-reported behaviour when measured only with reference to intentions (Boldero, 1995) and 20.1% when measured using a desire/self-prediction scale ( $\alpha = .89$ ) (Cheung *et. al.*, 1999). Another study using only intention items to tap BI reports  $\beta = .60$  ( $p < .05$ ) for the path between BI and self-reported car use (Bamberg & Schmidt, 2003). To summarise, half the operational definitions reviewed (four of eight) accord with the original approach and the (very) limited evidence suggests that these may be better predictors of behaviour than desires and self-predictions.

#### 4.5.2.2 Attitude (ATT)

- Theoretical definitions

Reviewed studies theoretically define ATT in two different ways. One echoes Ajzen's (1991a) definition: ATT as an overall evaluation of performing an act. Five studies offer such definitions (Flannery & May, 2000; Harland *et. al.*, 1999; Oom Do Valle *et. al.*, 2005; Steg, 2005; Taylor & Todd, 1995). Two of these (Steg, 2005; Taylor & Todd, 1995), plus seven others, provide the second type of definition: ATT as the product of beliefs about behavioural outcomes and their likelihood (Bamberg & Schmidt, 2003; Bang *et. al.*, 2000; Boldero, 1995; Cheung *et. al.*, 1999; Dahab *et. al.*, 1995; Kalafatis, Pollard, East and Tsogas, 1999; Steg & Uneken, 2002).

- Operational definitions

Ajzen & Fishbein (1980) operationalised ATT using direct measures; semantic-differentials such as *very negative/very positive* by which respondents evaluate a behaviour. Five of 13 relevant ESB studies use only direct ATT measures (Bang *et. al.*, 2000; Dahab *et. al.*, 1995; Flannery & May, 2000; Harland *et. al.*, 1999; Steg, 2005). Four of these reflect Ajzen's (1991a) advice, referring specifically to respondents' evaluations of performing the target behaviour. However, Steg (2005, 151) asked people "to what extent their family, friends or colleagues consider them as a car lover". The rationale was that this would "reduce the chance of social desirable responses" (Ibid.), but respondents' perceptions of others' perceptions seem quite different from Ajzen's (1991a) conception of ATT.

Direct ATT measures range from one item (Harland *et. al.*, 1999; Steg, 2005) to nine (Dahab *et. al.*, 1995). Only two of three studies using multi-item scales provide reliability statistics. Flannery & May (2000) report  $\alpha = .73$ , while Bang *et. al.* (2000) report  $\alpha = .80$  (both three-item scales).

Six further ESB studies combined direct and indirect measures (Bamberg & Schmidt, 2003; Boldero, 1995; Cheung *et. al.*, 1999; Ewing, 2001; Kalafatis *et. al.*, 1999; Taylor & Todd, 1995). Indirect measures use pairs of items tapping beliefs about behavioural outcomes and their importance to respondents. Overall scores are produced by summing the products of each pair. This is termed the 'expectancy-value' approach (Ajzen, 1991). A final study (Oom Do Valle *et. al.*, 2005) used only an indirect measure consisting of four item pairs ( $\alpha = .9067$ ). For example, one pair comprised "Household recycling is an important way to conserve energy" (*not important/very important*) and "It is important to save natural resources and the environment" (*totally false/totally true*).

To summarise, the review found three ways of tapping ATT; direct semantic-differentials, indirect expectancy-value measures and combinations of both. One direct measure did not refer to respondents' evaluations of the target behaviour, contrary to Ajzen's (1991a) advice.

- Results

Eight studies used direct ATT measures to explain BI in regressions, examining 15 relationships in total. Comparing regression coefficients and *p* values across studies is



somewhat problematic, as sample size influences these statistics. Nonetheless, comparison can offer insights. For example, are there behaviours for which ATT-BI paths are always or never significant? It should also be noted that some studies report unstandardised regression coefficients and others provide standardised coefficients ( $\beta$ ). While comparing  $\beta$  values for different paths in one study accounts for any differences in measurement scales, this does not apply between studies. The type of coefficient is noted when regression results are cited in this chapter.

Accepting these caveats, direct ATT measures significantly influenced BI ( $p < .05$ ) in 11 of 15 tests. Significant  $\beta$  values range from .14 to .62 (average = .37). All five single-item ATT measures had significant effects, as did six of 10 multi-item ATT scales. Behaviours with non-significant ATT-BI associations were green purchasing (Kalafatis *et al.*, 1999), pro-environmental decision-making at work (Flannery & May, 2000) and recycling (Dahab *et al.*, 1995). No other studies examined the first two behaviours, so it is impossible to specify reasons for the non-significant relationships (e.g. some property of the research setting, the behaviour itself, or the ATT items). Regarding recycling, Taylor & Todd (1995) and Cheung *et al.* (1999) report significant ATT-BI relationships, showing that recycling intentions can be related to ATT.

The reviewed studies report only one test of an indirect ATT measure's influence on BI (Boldero, 1995). This measure – using five item pairs ( $\alpha = .78$ ) – did not significantly influence recycling BI ( $p > .05$ ). Nor did it influence self-reported recycling behaviour.

Three further studies tested ATT-behaviour relationships. Ewing (2001) used three indirect ATT measures as separate predictors of self-reported recycling. Only one – tapping beliefs about recycling's environmental impacts – was significant (unstandardised regression coefficient = .86,  $p = .017$ ). Steg & Uneken's (2002) eight-item ( $\alpha = .87$ ) indirect ATT measure was non-significant for self-reported car use (Steg, 2005 reports the same study), while Oom Do Valle *et al.*'s (2005) four-item measure was non-significant for self-reported recycling.

Four studies examined associations between indirect and direct ATT measures in order to “better understand the relationships between belief structures and determinants of intention” (Taylor & Todd, 1995, 610). In the first, two indirect measures of beliefs about recycling and composting were used (*Ibid.*). These tapped the ‘relative advantage’ (i.e.

environmental benefit and its importance) and 'complexity' (i.e. difficulty of performing and its importance) of each behaviour. 'Relative advantage' significantly influenced ATT towards both recycling and composting (unstandardised regression coefficients of .38 and .35, respectively, both  $p < .001$ ). 'Complexity' had a significant effect on composting ATT only (unstandardised regression coefficient = -.05,  $p < .001$ ). In the second study (Kalafatis *et al.*, 1999), a scale based on five unspecified behavioural beliefs had significant effects on ATT towards green purchasing in two separate samples (unstandardised regression coefficients of .032 and .031, both  $p < .001$ ). The third study (Bamberg & Schmidt, 2003) reports a perfect relationship between a four-item behavioural belief scale and a two-item ATT towards car use scale ( $\beta = 1.00$ ,  $p < .001$ ). The final study did not regress ATT on behavioural beliefs, but reports a correlation of  $r = .66$  ( $p < .001$ ) (Cheung *et al.*, 1999).

In summary, ESB studies measure ATT in several ways. Broadly, these are direct, indirect and direct/indirect combinations. All single-item, direct measures significantly influenced BI in regressions, while more specific semantic-differentials (e.g. whether a behaviour is *correct/incorrect*, *beneficial/harmful*) (Cheung *et al.*, 1999) show less consistent effects in this regard. Indirect measures derived from behavioural beliefs and their importance are generally poor predictors of behaviour and BI, although only one test of the latter effect was reviewed. However, indirect measures often contribute significantly to explained variance in ATT as measured directly. Recycling is the only behaviour for which a large number of ATT-BI tests were reviewed, with mixed results.

#### 4.5.2.3 *Perceived behavioural control (PBC)*

- Theoretical definitions

According to Ajzen (1991a, 183; 2002, 665), PBC rests on beliefs about factors that may facilitate or hinder specific actions; capturing "perceived ease or difficulty". Only two of seven studies offering theoretical definitions refer to ease or difficulty (Oom Do Valle *et al.*, 2005; Tanner, 1999). Others all refer to underlying beliefs (Bamberg & Schmidt, 2003; Cheung *et al.*, 1999; Flannery & May, 2000; Harland *et al.*, 1999; Taylor & Todd, 1995). Two of these provide further detail, suggesting that PBC captures internal factors (e.g. skills) and external factors (e.g. resources) (Flannery & May, 2000; Harland *et al.*, 1999).

- Operational definitions

In discussing the “vexing problems” surrounding PBC’s “nature and measurement”, Ajzen (2002, 666) suggests operationalising the construct with reference to both perceived self-efficacy (PSE) (people’s beliefs about their capacity to perform a behaviour) and volitional control (VC) (beliefs about whether the behaviour is under the individual’s control). He also argues that direct and indirect PBC measures (the latter eliciting perceptions of facilitating or inhibiting conditions and weighting these by people’s expectations that they will pertain) are equally appropriate.

The 11 relevant studies reviewed used various ease/difficulty, PSE and VC items to operationalise PBC. Three employed single-item direct measures. Harland *et. al.* (1999) elicited ratings of VC. Von Borgstede & Biel (2002) asked about ease/difficulty. Barr, Gilg and Ford (2005, 1440) labelled their item ‘self-efficacy’, obtaining *strongly agree/strongly disagree* responses to the statement “It’s too complicated and inconvenient to act in ways which help the environment.” Whether this is PSE in the sense implied by Ajzen (2002) and derived from Bandura (1991, 257) – “the conviction that one can successfully execute the behaviour” – is debatable. How complicated a behaviour is may be a question of ease/difficulty and inconvenience seems to be an instrumental evaluation of the type underlying ATT.

Four studies employed multi-item direct PBC measures. Oom Do Valle *et. al.* (2005) used one ease/difficulty and one VC item to measure PBC for recycling. Tanner’s (1999) seven items asked about potential external barriers to using non-car modes (e.g. baggage). Flannery & May’s (2000) 11 items included two tapping PSE ( $\alpha = .89$ ), seven tapping aspects of organisational culture that might inhibit ethical decision-making ( $\alpha = .89$ ) and two tapping behaviour’s financial cost ( $\alpha = .64$ ). These latter two measures appear to tap perceived external constraints. Boldero (1995) reports using one VC item to measure PBC, but her study also included three measures of ‘contextual’ influences on recycling (e.g. storage space). Although treated separately from PBC, these could be interpreted as tapping external factors that might facilitate or inhibit behaviour. Items of this type were included in PBC scales by Tanner (1999) and Flannery & May (2000).

The remaining four studies combined direct and indirect PBC measures. Cheung *et. al.*’s (1999) five direct items comprised one measuring PSE, two measuring

ease/difficulty and two measuring VC. This study's indirect measure comprised item pairs asking how frequently respondents encountered eight situations and how likely these were to influence recycling. Taylor & Todd (1995) employed three direct VC measures for composting and recycling and three indirect PSE measures and one indirect measure assessing availability of resources for each behaviour. They also used five indirect measures of 'compatibility'; a construct from Rogers' (1983) diffusion theory that captures the extent to which a behaviour fits with people's lifestyles. The relationship between compatibility and PBC is questionable, however. Although some of Taylor & Todd's (1995) items refer to difficulty, others refer to convenience. As suggested above, this may be best conceptualised as influencing ATT, rather than PBC. Bamberg & Schmidt (2003) used two direct measures of PBC for using non-car modes; one ease/difficulty and one VC. Their two indirect measures assessed the extent to which car ownership and car availability were perceived to influence modal choice. Finally, Kalafatis *et al.* (1999) report using a two-item direct measure and a three-item indirect measure, but do not quote items.

In summary, operational definitions of PBC in ESB studies are inconsistent. Many reflect Ajzen's (2002) argument that PBC is multi-dimensional by assessing combinations of ease/difficulty, VC and PSE, but no two scales are identical. Some PBC measures include perceptions of specific external conditions (e.g. Tanner, 1999), while others treat such perceptions as separate variables (e.g. Boldero, 1995).

## - Results

Ajzen (1991a; 2002) suggests that PBC influences BI. Eight reviewed studies report 16 tests of this effect (i.e. BI regressed on a variable labelled PBC). Eleven tests show significant ( $p < .05$ ) effects. These arose from various measures, including a multi-item direct ease/difficulty, PSE and VC scale (Cheung *et al.*, 1999) (PBC-BI  $\beta = .21$ ), single-item direct VC scales (Harland *et al.*, 1999) (PBC-BI  $\beta = .43, .49, .32$  and  $.44$ ), a single-item direct external barriers scale (Flannery & May, 2000) (PBC-BI  $\beta = .20$ ) and multi-item indirect PSE and external barriers scales (Taylor & Todd, 1995) (PBC-BI unstandardised regression coefficients =  $.64$  and  $.15$ , respectively). The five non-significant PBC-BI paths also arose from different scales, suggesting no systematic relationship between the type of measure and the significance of the PBC-BI association. Furthermore, as with ATT, too few tests concerning each behaviour were

carried out to show whether some behaviours are more consistently linked with PBC than others.

As well as variables labelled PBC, other measures capturing beliefs about facilitating and inhibiting factors have been used to predict BI. On Ajzen's (1991a; 2002) conception, these are indicators of PBC despite not being termed as such. For example, Taylor & Todd (1995) report an unstandardised regression coefficient of .29 ( $p < .001$ ) for the path between perceived recycling service availability and recycling BI. Cheung *et al.* (1999) – as well as combining ease/difficulty, PSE and VC items – used these in two separate scales: 'perceived difficulty' (one PSE and two ease/difficulty items) and 'perceived controllability' (two VC items). These variables' influence on BI was compared to PBC's. 'Perceived difficulty' significantly influenced BI ( $\beta = -.25, p < .001$ ), but 'perceived controllability' did not. Such findings add to the evidence that PBC is multi-faceted and that different factors are likely to influence different behaviours in different situations.

Ajzen (1991a; 2002) also suggests that PBC should directly influence behaviour. Six reviewed studies test this effect (all self-reported behaviour except Boldero, 1995). In nine tests, three paths were non-significant at .05 level (Bamberg & Schmidt, 2003; Boldero, 1995; Cheung *et al.*, 1999). Those that were significant used single-item direct VC scales (Harland *et al.*, 1999) (PBC-behaviour  $\beta = .22, .44, .16$  and  $.39$ ), a multi-item direct ease/difficulty and VC scale (Oom Do Valle *et al.*, 2005) ( $\beta = .772$ ) and a multi-item direct external conditions scale (Tanner, 1999) ( $\beta = .42$ ).

Three studies assessed relationships between indirect and direct PBC measures. Cheung *et al.* (Ibid.) report correlations rather than  $\beta$  values. Their eight-item indirect measure correlated at  $r = .35$  with PBC,  $.37$  with 'perceived difficulty' and  $.18$  with 'perceived controllability' (all  $p < .01$ ). Bamberg & Schmidt's (2003) two-item indirect measure had a strong effect on PBC ( $\beta = .91, p < .05$ ), while Kalafatis *et al.* (1999) report unstandardised regression coefficients of  $.069$  and  $.088$  (both  $p < .001$ ) for paths between indirect and direct PBC measures in two separate samples.

In summary, the reviewed ESB studies are reasonably consistent in their theoretical definitions of PBC, but less consistent in their operational definitions. Single- and multi-item direct and indirect measures have been used, tapping ease/difficulty, PSE and VC

(all identified as components of PBC by Ajzen, 2002), as well as specific internal and external factors that may influence behaviour. Each type of measure is used in too few studies to allow many generalisations, so it is difficult to say whether it is the particular population and behaviour that determines PBC's influence, or how PBC is measured. The construct appears robust enough to exert the expected effects when measured in various ways, assuming that it is operationalised with the same specificity as the outcome variable.

#### 4.5.2.4 Subjective norm (SN)

- Theoretical definitions

Ajzen's (1991a, 188) SN construct captures "perceived social pressure to perform or not to perform" an act. Four of 16 reviewed definitions quote "perceived social pressure" (Bang *et. al.*, 2000; Barr *et. al.*, 2005; Harland *et. al.*, 1999; Steg, 2005). Others paraphrase, but none contradicts Ajzen's conception (e.g. Bratt, 1999; Hunecke *et. al.*, 2001). Nine publications also echo Ajzen (1991a) by defining SN as resulting from the individual's beliefs about the wishes of salient others and motivation to comply (Bamberg & Schmidt, 2003; Boldero, 1995; Cheung *et. al.*, 1999; Dahab *et. al.*, 1995; Ewing, 2001; Kalafatis *et. al.*, 1999; Oom Do Valle *et. al.*, 2005; Steg, 2005; Taylor & Todd, 1995). Steg & Uneken (2002) differentiate injunctive norms from descriptive norms. This is the only reviewed definition of SN that develops Ajzen's (1991a) conception.

- Operational definitions

Measurement of SN often approximates to Ajzen's (1991a, 195) method, directly asking the extent to which "important others" would dis/approve of respondents' actions. Of 16 reviewed measures, four used only items of this type (Bamberg & Schmidt, 2003; Cheung *et. al.*, 1999; Flannery & May, 2000; Harland *et. al.*, 1999), while a fifth also used items specifying "people who influence my decisions" (Taylor & Todd, 1995). Two publications report the same direct items specifying potentially salient groups (family, friends, colleagues) (Steg, 2005; Steg & Uneken, 2002). Two items refer to each group; measuring injunctive and descriptive norms. Another study elicited salient referents from respondents themselves (Hunecke *et. al.*, 2001). A ninth study used "People in this community expect others to recycle" (*strongly agree/strongly disagree*), stating "it was assumed that... 'community' would be interpreted as 'persons who are important'" (Dahab *et. al.*, 1995, 253). Where reported, scale reliabilities are

generally high (range  $\alpha = .60$  to  $.88$ , average =  $.75$ ). Only Steg (2005) and Steg & Uneken's (2002) three injunctive norm items were not considered sufficiently correlated to be combined in a scale.

Of seven further relevant studies, one gives no scale details (Kalafatis *et. al.*, 1999) and four report indirect SN measures specifying particular groups (again, including friends and family) and weighting perceptions of what each group wanted respondents to do by respondents' motivation to comply (Boldero, 1995; Bratt, 1999; Ewing, 2001; Oom Do Valle *et. al.*, 2005). Finally, Barr *et. al.* (2005) used a single-item direct measure of descriptive norm only, while Von Borgstede & Biel's (2002) single direct item elicited *absolutely not/absolutely* responses to "Do you think that others in your workplace think they ought to [behaviour]?". Rather than SN as commonly conceptualised, this appears to measure respondents' perceptions of other people's personal norms.

- Results

In the four studies using only 'important others' items, SN predicted BI in seven of eight tests. Significant ( $p < .05$ )  $\beta$  values ranged from  $.12$  to  $.40$  (average =  $.22$ ) (Bamberg & Schmidt, 2003; Cheung *et. al.*, 1999; Flannery & May, 2000; Harland *et. al.*, 1999). Taylor & Todd (1995) report two SN-BI tests with unstandardised regression coefficients of  $.20$  and  $-.08$  (both  $p < .001$ ). It seems, therefore, that while perceptions concerning 'important others' usually influence BI in ESB studies, they are generally not as influential as ATT or PBC. This echoes findings across behavioural domains (Armitage & Conner, 2001).

Three further studies tested SN as a predictor of BI. Kalafatis *et. al.* (1999) report  $\beta = .42$  ( $p < .001$ ) but provide no scale details. Dahab *et. al.*'s (1995) item assuming that "community" equals 'important others' was non-significant for BI, as was Boldero's (1995) indirect SN measure.

Six studies used SN to predict variables other than BI. Boldero (1995) found that SN had no significant effect on (observed) recycling, while Ewing (2001) found that perceptions of households', friends' and neighbours' wishes predicted recycling, but perceptions concerning councils, businesses and environmental groups did not. Oom Do Valle *et. al.*'s (2005) indirect SN measure – citing friends, family and neighbours –

also influenced recycling ( $\beta = .186, p = .005$ ). Steg (2005) and Steg & Uneken (2002) report  $\beta = .23$  ( $p = .018$ ) for the influence of families' wishes on respondents' car use. Friends' and colleagues' wishes had no effect. Descriptive norms had a stronger effect on behaviour ( $\beta = .30, p < .001$ ) than injunctive norms in this study. Hunecke *et al.* (2001) report SN-travel behaviour  $\beta = .19$  ( $p < .05$ ), using a scale in which respondents identified three people who they "regard[ed] as being particularly close to" them. (Self-reported behaviour unless stated in the above studies.) Hunecke *et al.* (Ibid.) also report SN-PN  $\beta = .28$  ( $p < .01$ ) and Bratt (1999) – tapping perceptions of partners', children's and neighbours' wishes regarding recycling – found SN-PN  $\beta = .28$  ( $p < .05$ ).

As with ATT and PBC, some researchers have examined associations between SN and underlying beliefs. Cheung *et al.* (1999) report  $r = .59$  ( $p < .001$ ) between their four-item SN measure and an indirect scale comprising six item pairs asking whether specified referents (e.g. "best friends") thought that the individual should recycle and the individual's motivation to comply. Bamberg & Schmidt (2003) and Kalafatis *et al.* (1999) also report the expected significant relationships, although these studies regressed SN on underlying beliefs rather than stating correlations.

Harland *et al.* (1999) provide a final notable set of results regarding SN. They added PN to the TPB in regressions predicting BI and (self-reported) ESBs. In five regressions with BI as the outcome variable, SN was a significant ( $p < .05$ ) predictor in four instances when entered alongside ATT and PBC. However, when PN was added, SN-BI  $\beta$  values dropped in each case and three of the four previously significant paths rose above the .05 threshold. Very similar results were obtained with behaviours as outcome variables.

In sum, SN often influences BI for ESBs, but generally has weaker effects than ATT or PBC. Single items referring to 'important others' seem to be as effective as multiple items citing specific groups. SN has also been shown to predict PN and behaviour; effects not postulated by Ajzen (1991a). Moreover, Harland *et al.* (1999) suggest some overlap between the normative motivations captured by SN and PN. Finally, the reported tests show the expected associations between SN and underlying beliefs.



### 4.5.3 Results for NAT constructs

#### 4.5.3.1 Personal norm (PN)

- Theoretical definitions

Schwartz (1977, 227) conceptualised PN as “self-expectations for specific action in particular situations... experienced as feelings of moral obligation”. Of 13 reviewed studies that theoretically define PN, 11 refer to “obligation” (Bamberg & Schmidt, 2003; Black, Stern and Elworth, 1985; Flannery & May, 2000; Guagnano, Stern and Dietz, 1995; Harland *et. al.*, 1999; Hunecke *et. al.*, 2001; Nordlund & Garvill, 2002; 2003; Oom Do Valle *et. al.*, 2005; Tanner, 1999; Stern *et. al.*, 1999) and one refers to “expectations held by the individual about how he or she ought to behave” (Von Borgstede & Biel, 2002, 2). There are, however differences in specificity. While Schwartz stressed “specific action”, six ESB studies either do not specify what obligations are for (Bamberg & Schmidt, 2003; Hunecke *et. al.*, 2001; Nordlund & Garvill, 2002; Tanner, 1999), or refer to ESB generally (Nordlund & Garvill, 2003; Stern *et. al.*, 1999). The thirteenth definition is quite distinct. Stern, Dietz and Black (1986) conceptualise PN as “beliefs about what *ought* to be done” (emphasis in original), but not by the individual. These beliefs refer to others’ obligations and are not ‘personal’ in Schwartz’s (1977) sense.

- Operational definitions

Operational definitions of PN vary considerably. Schwartz (1977, 234) suggested items referring to personal obligation for specified actions. Only three of 13 relevant studies used this method (Black *et. al.*, 1985; Flannery & May, 2000; Nordlund & Garvill, 2003), although Bratt (1999) asked whether people felt that they “should” recycle and Von Borgstede & Biel (2002, 2) asked respondents “Do you think that you ought to [behaviour]”, which also seem to be questions of personal obligation. Other studies tapped behaviour-specific personal obligation, but alongside guilt over not acting (Bamberg & Schmidt, 2003; Barr *et. al.*, 2005; Harland *et. al.*, 1999; Oom Do Valle *et. al.*, 2005) or feelings of responsibility (Hunecke *et. al.*, 2001). Nordlund & Garvill (2002) and Stern *et. al.* (1999) measured beliefs about personal obligation for general environmental protection, but the latter also included items about the obligations of government and industry to take specific pro-environmental actions. Stern *et. al.* (1986) only measured beliefs about institutional obligations for specific actions. The 13 studies thus illustrate six different ways of operationalising PN.

- Results

Schwartz's (1977, 231) proposition that PN is "the motivational construct energizing altruistic behavior" is supported by the review. Studies tested 17 PN-behaviour relationships (all self-reported) and significant ( $p < .05$ )  $\beta$  coefficients are reported in 15 instances (range  $\beta = .11$  to  $.59$ , average =  $.32$ ). Behaviours on which PN exerted significant effects include using non-car modes (e.g. Bamberg & Schmidt, 2003), recycling (e.g. Bratt, 1999) and using unbleached paper (Harland *et al.*, 1999), as well as an index of several ESBs (Nordlund & Garvill, 2002). There is no obvious link between type of operational definition and strength of PN-behaviour influence. The strongest ( $\beta = .59$ ,  $p < .05$ ) rested on a scale comprising two items worded "I should [behaviour] because [consequence]" (*agree completely/disagree completely*) (Bratt, 1999). "I feel moral obligation to [behaviour]" (*agree not at all/agree totally*) also produced a relatively strong influence ( $\beta = .46$ ,  $p < .05$ ) (Nordlund & Garvill, 2002). These measures reflect Schwartz's (1977) method, tapping behaviour-specific personal obligation. The two ESBs for which PN was non-significant were major energy-efficiency investments (Black *et al.*, 1985) and environmental activism (Stern *et al.*, 1999). While Black *et al.*'s (1985) four PN items tapped only behaviour-specific personal obligation ( $\alpha = .58$ ), Stern *et al.* (1999) used three items of this type plus five referring to business and government obligations and one to "people like me" ( $\alpha = .88$ ).

As well as behaviour, studies test PN's effect on BI (Flannery & May, 2000; Harland *et al.*, 1999; Stern *et al.*, 1986), or willingness to undertake specified actions (Nordlund & Garvill, 2003; Von Borgstede & Biel, 2002). PN also performs well here, being significant ( $p < .05$ ) for eight of 10 BI/willingness measures. Significant  $\beta$  values range from  $.16$  to  $.44$  (average =  $.35$ ). Again, there is no obvious link between measurement instrument and strength of PN's effect. The strongest influence rested on a single item asking whether "respondents perceived it to be a personal moral obligation to reduce car use" (Nordlund & Garvill, 2003, 343). However, one non-significant effect also derived from items based on Schwartz's suggested operationalisation (Flannery & May, 2000). The second rested on beliefs about the obligations of others (Stern *et al.*, 1986). Despite these few negative findings, PN is generally robust to differences in measurement and exerts the expected effects.

#### 4.5.3.2 Ascription of responsibility (AR)

- Theoretical definitions

NAT's original responsibility construct was defined as a general tendency towards responsibility denial (RD) (Schwartz, 1977). The studies reviewed here, however, uniformly adopt a situation-specific approach, using AR. Seven of eight theoretical definitions reviewed cast AR in terms of personal responsibility for particular actions, or for bringing about particular consequences (Bamberg & Schmidt, 2003; Black *et al.*, 1985; Hunecke *et al.*, 2001; Oom Do Valle *et al.*, 2005; Stern *et al.*, 1986; Stern *et al.*, 1999; Tanner, 1999). For example, Tanner (*Ibid.*, 146) defines AR as referring to instances "when people judge themselves to be responsible for outcomes" of a particular behaviour. Only one definition is not person-specific, referring to the responsibilities of "individuals like" the respondent (Guagnano *et al.*, 1995, 707).

- Operational definitions

None of the reviewed studies employed RD as a responsibility measure, so none used Schwartz's (1977) scale assessing tendency to deny responsibility across situations. Approaches vary, however, even among six studies measuring responsibility. Just two tap the most common theoretical definition of AR; behaviour-specific personal responsibility. Bamberg & Schmidt (2003) used two such items, for example "With my travel mode choice... I am responsible for traffic pollution" (*agree/disagree*), while Guagnano *et al.* (1995) tap responsibility "to oneself for recycling". A third study measured group responsibility, ascribed "for energy saving to households" (Black *et al.*, 1985). The fourth reports one item of this type, "Everybody has a duty to contribute to a reduction of smog by reducing automobile use" (*not true/very true*) (Tanner, 1999, 150), but the other items in the three-item scale are not reported. The fifth study moves beyond groups to which the respondent belongs, eliciting ratings of government and industry responsibility for environmental problems (Stern *et al.*, 1986). These are beliefs about others' responsibilities, rather than personal responsibility. The sixth study states that "AR was not regarded as an autonomous construct because the causal effects of individual behavior on the environment are already contained in the AC" (Hunecke *et al.*, 2001, 833). One might, therefore, not expect to find items specifically referring to responsibility. However, three of six items in the PN scale tap AR. For example, "I feel responsible for preserving the environment in my choice of daily means of transport" (*do not agree at all/agree extremely*) (*Ibid.*).

- Results

Schwartz (1977) found that responsibility moderated the PN-behaviour relationship. Only one reviewed study tested this effect (Bamberg & Schmidt, 2003). With AR operationally defined as personal responsibility for specific acts, no moderating effect was found. Schwartz's assertion that AR influences PN was supported, however ( $\beta = .55, p < .05$ ). AR as group responsibility for specific acts also influenced PN for three of four energy saving behaviours ( $\beta = .10, .23$  and  $.23$ , all  $p < .05$ ) (Black *et al.*, 1985). Stern *et al.*'s (1986) AR measure referred to others' responsibilities for environmental problems, while the PN measure referred to their obligations to solve the problems. Thus, both scales had the same referents, even though they differed from the common conceptions of AR and PN. In two tests of AR-PN effects, one relationship was non-significant and the other significant ( $\beta = .46, p < .01$ ).

Guagnano *et al.* (1995) did not measure PN, but report a direct AR-self-reported recycling behaviour effect ( $\beta = .36, p < .01$ ). Similarly, Tanner (1999) reports a direct AR-self-reported car use influence ( $\beta = -.29, p < .001$ ).

Hunecke *et al.* (2001), whose PN scale contained AR items, report PN-behaviour  $\beta = .22$  ( $p < .01$ ). One cannot know, however, whether the influence on behaviour was due to PN, AR, or both. Guagnano *et al.* (1995) and Tanner's (1999) results show that direct AR-behaviour effects are possible.

In sum, the studies reviewed generally support the AR-PN influence. They provide no evidence that AR moderates PN-behaviour, but do report direct AR-behaviour effects not postulated by Schwartz (1977). Thus, even among the few studies that operationalise AR, both measures and findings are rather inconsistent.

#### 4.5.3.3 Awareness of consequences (AC)

- Theoretical definitions

Schwartz (1977, 229) defined AC as a "tendency to become aware of the consequences of one's behavior for others". However, AC is not defined as a tendency in any of the 11 reviewed studies providing theoretical definitions. These definitions are less general, focusing on consequences of specific conditions or actions. Condition-focused definitions refer to beliefs about the consequences of environmental problems (e.g. Guagnano *et al.*, 1995; Stern *et al.*, 1999). Nordlund & Garvill (2002; 2003) even

re-name AC as 'problem awareness'. An example condition-focused definition is AC as "awareness of negative consequences for others of a state of affairs" (Guagnano *et. al.*, 1995, 707). Seven action-focused definitions refer to consequences of behaviours (Bamberg & Schmidt, 2003; Black *et. al.*, 1985; Bratt, 1999; Hunecke *et. al.*, 2001; Oom Do Valle *et. al.*, 2005; Stern *et. al.*, 1986; Tanner, 1999). An example action-focused definition is AC as capturing "the causal relation between behaviour and environmental consequences" (Hunecke *et. al.*, 2001, 833). This conception of AC, focusing on specific behavioural outcomes, is akin to beliefs underlying the ATT construct. Indeed, Oom Do Valle *et. al.* (2005) – in a model combining NAT and TPB constructs – measure ATT but not AC on the assumption that they are analogous.

- Operational definitions

Schwartz (1977) measured AC as a tendency, using narratives in which a character's choices affect others. Respondents described the character's thoughts, with AC scored by references to others' needs. Just as no study reviewed here theoretically defined AC as a tendency, none measured it as such. Echoing their theoretical definitions of the construct, ESB studies use items referring either to consequences of specified environmental conditions or consequences of actions.

Two studies used condition-focused AC scales referring to consequences for multiple entities. Stern *et. al.* (1999) differentiated consequences for self and family, respondents' country and plants and animals. Nordlund & Garvill (2002) differentiated general consequences from those for self and for the biosphere.

Nordlund & Garvill (2003) differentiated consequences of environmental conditions for the biosphere and humankind and also measured beliefs about the consequences of respondents' own actions, although the condition- and action-focused items were not combined into one scale. Three further studies used condition-focused measures, but did not distinguish between consequences for different entities (Bamberg & Schmidt, 2003; Stern *et. al.*, 1986; Tanner, 1999).

Four studies used only action-focused AC measures. These can be subdivided into those concerning consequences of respondents' own behaviour and those concerning wider performance of a behaviour. Bratt (1999), for example, used two items; one concerning consequences of the individual's recycling behaviour, the other concerning

consequences of recycling more generally. Black *et. al.* (1985) and Guagnano *et. al.* (1995) asked only about general behavioural consequences, while Hunecke *et. al.* (2001) asked only about the consequences of respondents' actions.

- **Results**

AC has been operationalised in many ways and with various purposes. Only two studies test Schwartz's (1977) hypothesis that AC moderates PN's influence on behaviour. One used an action-focused AC scale (Bratt, 1999), the other a condition-focused scale (Bamberg & Schmidt, 2003). Neither shows any moderating effect. Nine studies investigate Schwartz's (1977) proposed AC-PN influence, reporting 14 tests (Bamberg & Schmidt, 2003; Black *et. al.*, 1985; Bratt, 1999; Hunecke *et. al.*, 2001; Nordlund & Garvill, 2002; 2003; Stern *et. al.*, 1986; Stern *et. al.*, 1999; Tanner, 1999). Ten tests show significant ( $p < .05$ ) effects. Significant  $\beta$  values range from .14 to .42 (average = .22). The strongest influence rests on a 12-item, condition-focused AC scale ( $\alpha = .82$ ) referring to consequences for self and biosphere (Nordlund & Garvill, 2002), but action-focused measures also predict PN (Black *et. al.*, 1985; Bratt, 1999; Hunecke *et. al.*, 2001). The non-significant AC-PN relationships derive from one action-focused scale (Black *et. al.*, 1985) and two condition-focused scales (Bamberg & Schmidt, 2003; Tanner, 1999). Thus, there appears to be no systematic difference between action- and condition-focused AC scales as predictors of PN.

ESB research often tests effects not postulated by Schwartz (1977). One reviewed study tested AC's direct influence on behaviour (Guagnano *et. al.*, 1995). The action-focused scale had no significant effect on self-reported recycling. Another study – this time using a condition-focused AC scale – tested two AC-BI effects (Stern *et. al.*, 1986). AC had a significant effect on intentions to influence government action on pollutants ( $\beta = .37$ ,  $p < .01$ ), but not on intentions to influence industry action.

As well as PN, behaviour and BI, AC has been used to predict AR (Black *et. al.*, 1985; Guagnano *et. al.*, 1995; Stern *et. al.*, 1986). AC was a significant ( $p < .05$ ) predictor of AR in four of seven tests of this relationship (average  $\beta$  for significant paths = .36). Both action- and condition-based AC measures had significant effects on AR in some tests, but not in others.

#### 4.5.4 Reporting

Table 4.1 shows where reviewed studies appeared, the behaviour and/or intention investigated and whether they report all items, scale reliabilities and *p* values. There are few patterns to the publications in which information was not provided. Omissions occur in journals devoted to environmental psychology, social psychology, consumer issues, human ecology and management. It is notable, however, that neither report in a consumer journal (Dahab *et. al.*, 1995; Kalafatis *et. al.*, 1999) provides full item details, making it impossible to know exactly what was measured. Of 17 studies in environmental or social psychology publications, 13 (76%) provide all three types of information.

#### 4.6 Discussion

This chapter reviews ESB studies using Schwartz's (1977) NAT and/or Ajzen's (1991; 1991a) TPB; the two most common theories in the domain. The first aim was to establish which (if either) theory best explains ESB. The second aim was to assess how far research using these theories contributes to a cumulative understanding. To this end, a micro-level analysis focusing on individual constructs was undertaken. This analysis had two premises. Firstly, the extent to which research provides a cumulative understanding depends on how far studies share construct definitions. The more widely shared, the greater findings' comparability and the confidence that can be placed in their generalisability. However, it was acknowledged that some variation in operational definitions can increase generalisability; demonstrating constructs' robustness to differences in measurement. Secondly, cumulative understanding is aided by consistency in theoretical structures across studies. While no theory is immutable (as illustrated by Ajzen's (2002) re-conceptualisation of PBC), changes should build on theoretical and/or empirical foundations (Oom Do Valle *et. al.*, 2005; Stern, 2000). This is not to say that new research directions are never fruitful, but it seems sensible to develop existing findings via small steps if "the goal of science is a consensus of rational opinion" (Ziman, 1991, 3). The review also uncovered a third issue affecting incremental accumulation of knowledge: research reporting. The discussion is organised into sections reflecting these issues.

#### 4.6.1 NAT and the TPB as explanations of ESB

##### 4.6.1.1 Overview across behaviours

Overall, one can say that the reviewed studies demonstrate NAT and the TPB's applicability to ESB. Although section 4.5 showed that expected relationships between constructs are not always observed, this does not invalidate the theories' use. Even when one construct is non-significant, a set of constructs forming a well-defined model may still explain a behaviour. For example, Harland *et. al.* (1999) report that PBC was non-significant for intentions to reduce red meat consumption. However, the coefficient of determination ( $R^2$ , which expresses the proportion of variance in the outcome explained by a regression model) between this intention and the TPB was .47. The TPB explained 47% of variance in BI, despite PBC's non-significance. Although reducing red meat consumption was generally said to be controllable – meaning that intentions to perform or not to perform the behaviour could not easily be explained by levels of PBC – the other TPB variables were more useful in this regard.

In a meta-analysis of ESB studies, Hines *et. al.* (1987) report a corrected correlation coefficient of  $r = .347$  between attitudinal (i.e. psychological) factors and behaviour. Although they were not solely concerned with NAT and the TPB, this indicates the approximate level of explained variance in ESB that can be expected from psychological models in general. A recent meta-analysis of TPB studies across behavioural domains showed this theory accounting for 27% and 39% of variance in behaviour and BI, respectively (Armitage & Conner, 2001). Although no NAT meta-analyses could be found, this evidence suggests that one might reasonably expect  $R^2$  values in the .25 to .40 range for models applied to ESB and ESB intentions.

Models in the reviewed studies generally meet and sometimes exceed this expectation. Taylor & Todd (1995), for example, report TPB  $R^2 = .88$  for intentions to compost household waste. Bamberg & Schmidt (2003) report a more modest, but respectable, TPB  $R^2$  of .45 for self-reported car use. The lowest TPB  $R^2$  in any reviewed study was .277, for self-reported recycling (Cheung *et. al.*, 1999). (As expected, TPB  $R^2$  was usually higher for BI than behaviour. Many factors can prevent intentions from translating into actions, so associations between ATT, PBC, SN and behaviour are generally weaker than their associations with BI.)



$R^2$  values for NAT models are similar. They range from .90 for self-reported energy-efficiency investments (Black *et. al.*, 1985) to .14 for self-reported car use (Bamberg & Schmidt, 2003), but most are between .20 and .45. However, a striking observation concerning  $R^2$  values is that those for models combining NAT and TPB variables tend to be higher than those for the individual theories. This is, at best, a rough comparison. As noted in section 4.5.2.2, many statistics are affected by sample size and  $R^2$  is among them. It is also affected by the number of regressors. Nonetheless, average  $R^2$  for the 10 models comprising both NAT and TPB variables is .49 (Bamberg & Schmidt, 2003; Bratt, 1999; Harland *et. al.*, 1999; Hunecke *et. al.*, 2001; Oom Do Valle *et. al.*, 2005; Tanner, 1999); higher than the averages for NAT or TPB models (.40 and .42, respectively).

The effect of combining TPB and NAT variables is demonstrated by Harland *et. al.* (1999), who performed regressions adding PN to the TPB when explaining five intentions (using unbleached paper, reducing red meat consumption, using non-car travel modes, using energy-saving lights and conserving water). ATT, SN and PBC were entered as predictors of BI in one block, followed separately by PN. In all five regressions, there were significant ( $p < .01$ ) increases in  $R^2$  after PN's addition and  $\beta$  weights for each TPB variable fell. Moreover, in several instances,  $p$  values associated with TPB variables'  $\beta$  weights rose above .05. This suggests that PN accounted for some of the variance captured by ATT, PBC and SN and that adding PN to the TPB improved the models' ability to explain BI. This empirically supports the suggestion made in section 4.4 that the two theories together capture a wider range of motives for ESB than either on its own. As Bamberg & Schmidt (2003, 280) point out, these "models were developed in different research contexts and focus on different aspects of social behaviour." As such, they should be viewed as complementary rather than competing and the best approach may be to integrate them. This suggestion is taken up in the study presented in Chapter 5.

#### 4.6.1.2 Theories' applicability to particular behaviours

Table 4.1 shows the behaviours and/or intentions investigated in each reviewed study. Some were only examined once (e.g. purchasing renewable energy for the home; Bang *et. al.*, 2000) and only recycling and travel mode choice have received enough attention to allow the possibility of saying which theory might be most applicable.

Six studies give  $R^2$  values for recycling models (four TPB, one NAT, one combined). The TPB studies provide impressive figures for explanation of recycling BI:  $R^2 = .358$  (Boldero, 1995), .544 (Cheung *et. al.*, 1999), .57 (Dahab *et. al.*, 1995) and .99 (Taylor & Todd, 1995). Two of these studies also predicted behaviour. As expected, Cheung *et. al.*'s (1999)  $R^2$  of .277 (based on BI and PBC as predictors of self-reported behaviour) was lower than that for BI (predicted by ATT, PBC and SN). Boldero's (1995)  $R^2$  of .801 for observed behaviour, however, was far higher than that for BI. This is because the predictors of observed behaviour were BI and past behaviour, but past behaviour was not used to predict BI and this variable exerted a very strong influence on observed behaviour. These findings illustrate the difficulty of comparing models between studies even when they apply the same theory.

Guagnano *et. al.* (1995) report  $R^2 = .25$  for self-reported recycling, based on the NAT variables AR and AC and the contextual variable 'possession of recycling bin'. Bratt (1999) reports  $R^2 = .348$  for self-reported recycling with PN as the only direct predictor and AC and SN as predictors of PN. Again, model differences complicate matters and since no two of the six recycling studies reviewed here used exactly the same model, it is hard to meaningfully compare them. The only sure way to compare different models' ability to explain a behaviour is to test them using the same sample with exactly the same behaviour/intention as the regression outcome. Of the reviewed studies, only Bamberg & Schmidt (2003) took this approach; comparing NAT and the TPB's ability to explain travel mode choice. One can say that in their research setting (a German university), the TPB was better able to explain modal choice than NAT ( $R^2 = .45$  and .14, respectively). Trying to compare this study with other studies of travel mode, one encounters the same problems as with the recycling studies; different model structures, operational definitions, outcome variables and sample sizes.

Given these difficulties, one might ask why this review was not conducted as a meta-analysis. According to Hines *et. al.* (1987, 2), these "precise statistical methods... permit the determination of the relative strengths of associations between each variable and responsible environmental behavior", whilst correcting for differences in scale reliabilities, sample sizes and so on. However, for the present purpose, it is not clear that meta-analysis would have been "far superior to more subjective narrative discursive reviews" (Ibid.). Meta-analysis would not show how operational definitions of nominally-identical constructs differ; an observation that is central to this chapter. Nor is

meta-analysis free from narrative reviews' 'subjectivity'. Meta-analysts must still identify "key characteristics and findings from each study" and "suspected moderator" variables (Ibid.). These tasks require interpretation and assumptions.

In summary, while NAT and the TPB explain several ESBs, this review does not permit judgements about which is best suited to the domain. However, as Bamberg & Schmidt (2003) suggest, hoping for such judgements may be misguided. It may be better to see NAT, the TPB and their constructs as complementary. Studies that do so provide encouraging results (e.g. Harland *et. al.*, 1999; Oom Do Valle *et. al.*, 2005) and seem to justify Stern's (2000, 420) argument that ESB research "needs synthetic theories" incorporating variables from the many models that have been applied in the domain.

#### 4.6.2 *Construct definitions*

Having discussed theory-level findings, we turn to the construct-by-construct analysis. As *Table 4.2* shows, each construct has been theoretically and operationally defined in various ways, some quite different from their original conceptions. Some changes have been widely adopted, such as theoretical and operational definition of AC and AR as situation-specific (e.g. Bamberg & Schmidt, 2003). Here, although ESB research abandons constructs' original definitions, cumulative knowledge has developed because re-definition is relatively consistent. However, the review reveals two ways in which variation in constructs' definitions may hinder development of a cumulative understanding.

##### 4.6.2.1 *Nominally-identical constructs are operationalised very differently*

An example of problems arising when very different measures are used for nominally-identical constructs comes from two studies using SN to predict BI (Bamberg & Schmidt, 2003; Dahab *et. al.*, 1995). The first reports a strong, significant effect, while the second reports no significant relationship. Of course, this may be due to different influences acting in different research settings (Ajzen, 1991), or to parameters such as sample size. But because Bamberg & Schmidt (2003) asked respondents what "people who are important" to them wanted, while Dahab *et. al.* (1995) asked what "people in this community expect", we cannot discount definitional differences as the reason for differences in findings. No justification is offered for Dahab *et. al.*'s (Ibid., 253) assumption that "community" would be interpreted as "persons who are important". This appears to be an arbitrary development of SN, leading to uncertainty over whether

its influence really fails to generalise to a particular setting and whether Ajzen's (1991a) suggested means of measuring SN – which is common among ESB studies – would have produced a different result.

Definitions of PN highlight a different problem. While Dahab *et. al.* (1995) assume that their SN measure is analogous with the common operational definition, Stern *et. al.* (1986) make no such claim of their 'PN' measure, which is entirely different from Schwartz's (1977, 227) normative "self-expectations", referring instead to individuals' beliefs about what others ought to do. (Barr *et. al.*'s (2005) SN item also taps such perceptions.) This means that taking Stern *et. al.*'s (1986) findings at face value and interpreting them after inspecting the 'PN' items may lead to different conclusions. It is not 'PN' in the usual sense that influences BI, but a substantively different construct. Such variation in operational definitions of constructs with the same name complicates comparison of studies' results. New constructs should have new labels.

Different operational definitions of nominally-identical constructs are not *necessarily* problematic, however. They can enable comparison of alternative measures when consensus is yet to emerge about which is most appropriate. PBC, for example, has been operationalised in many ways in ESB research, using VC, PSE, ease/difficulty and perceived context items. The construct is sufficiently robust that it usually exerts the expected effects despite definitional differences. However, since there is good evidence of PBC's multi-dimensionality (e.g. Cheung *et. al.*, 1999), it would seem wise to combine different control measures even though single items often significantly influence BI and/or behaviour (e.g. Harland *et. al.*, 1999). This would also reflect the wider social-psychological literature (Ajzen, 2002; Leach, Hennessey and Fishbein, 2001; Sparks *et. al.*, 1997; Terry and O'Leary, 1995; Trimafov *et. al.*, 2002). Indeed, based on a review of TPB studies across behavioural domains, Ajzen (2002, 679) has suggested treating PBC as a "hierarchical construct" capturing various control factors. Without systematic comparison of alternative measures, we could not draw such conclusions.

#### 4.6.2.2 *Constructs are conflated*

Conflation is problematic because when constructs are combined, we cannot know which component of the combined variable is having an influence or being influenced. Again, empirical justification is important. Where constructs cannot be empirically

distinguished, it may be reasonable to treat them as one. But where they have been shown to be empirically distinct, this is doubtful.

For example, Cheung *et. al.* (1999) used a 'BI' scale combining desire and self-prediction items not actually referring to 'intentions', making it impossible to say whether desires, self-predictions, or both influenced self-reported recycling. Furthermore, questions over whether desire's influence on behaviour is mediated by intentions and/or self-predictions, or whether desire moderates the PBC-behaviour relationship (Armitage & Conner, 2001) require that intentions, desires and self-predictions are operationalised as distinct variables.

Hunecke *et. al.* (2001) measured 'PN' using personal responsibility as well as obligation items. They report a factor analysis where responsibility and obligation items loaded high on the same factor. Loadings for the five items ranged from .60 to .73, none of the items loaded on any other factor higher than .40 and no other items loaded on the 'PN' factor higher than .35. Thus, although the combination of obligation and responsibility items in one 'PN' scale is counter to studies that empirically distinguish AR from PN (e.g. Black *et. al.*, 1985) and to Schwartz's (1977) distinction between RD and PN, Hunecke *et. al.* (2001) provide empirical justification for the combined measure in their research setting. Their respondents seemed not to differentiate between feelings of obligation and responsibility. It remains somewhat confusing that responsibility items were included in the 'PN' measure when responsibility was assumed to be captured by AC (see section 4.5.3.2), but there was at least empirical justification for the decision.

Despite such difficulties, confusion does not reign in ESB research. The reviewed studies contribute much to a cumulative understanding. By comparing them, one can draw conclusions about alternative measures. For example, it seems that BI (as operationally defined by Ajzen & Fishbein, 1980) predicts ESB more successfully than desires or self-predictions. This observation rests on just three studies (Bamberg & Schmidt, 2003; Boldero, 1995; Cheung *et. al.*, 1999), so one cannot yet claim that it applies across ESBs. But it does suggest that future research could try to establish consensus on the predictive power of alternative direct antecedents of behaviour. One can also say that single-item direct ATT measures are reliable predictors of BI, while multi-item indirect ATT measures perform less well. However, indirect measures of

ATT, PBC and SN tend to predict these constructs as measured directly (e.g. *Ibid.*; Bamberg & Schmidt, 2003). As Taylor & Todd (1995) suggest, indirect measures can clarify the belief structures underlying overall evaluations. These findings illustrate the incremental accumulation of knowledge resulting from the reviewed studies.

#### 4.6.3 *Theory structure*

It has been argued that some variations in constructs' operational definitions help to develop cumulative understanding while others are a hindrance, depending on whether the variation is theoretically and/or empirically justified. The same can be said of variations in theories' structures.

Schwartz (1977) and Ajzen (1991; 1991a) provide detailed accounts of their theories, to which ESB research exhibits varying degrees of faithfulness. At one extreme, Bamberg & Schmidt (2003) compare the two theories' ability to explain travel mode choice, using both models' original formulations. As well as assessing NAT's mediating effects, analyses tested whether AC and AR moderated PN's influence on behaviour. In the TPB analysis, PBC's direct effect on behaviour was tested, as well as its indirect effect via BI. Testing all of a theory's propositions enables comparison of a full range of findings, but this is rare in the research reviewed. Only Bamberg & Schmidt (*Ibid.*) tested both NAT moderating effects, while Bratt (1999) tested for AC moderating PN-behaviour. No other study tested either effect.

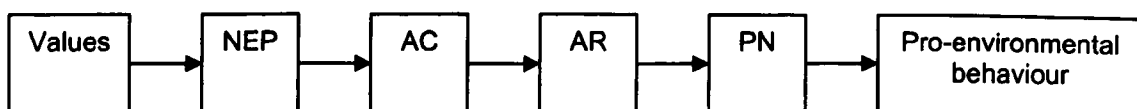
In contrast to Bamberg & Schmidt (2003) are Bang *et. al.* (2000), who despite publishing nine years after Ajzen (1991a) added PBC to the TRA to develop the TPB, applied the TRA in their research. Moreover, they did not measure SN, meaning that ATT was the only predictor of BI. This seems to be a missed opportunity to increase our understanding of effects that – as this review shows – often influence ESB.

In TPB research it is common for the regression outcome variable to be BI rather than behaviour (e.g. Taylor & Todd, 1995). This may not be ideal (see section 4.6.1.1), but is understandable because of the difficulty of collecting prospective behavioural data. It is harder to see why NAT studies cannot test moderating effects using data on AR, AC, PN and past behaviour. In fact, few studies measure AR, despite apparently widespread theoretical acceptance that it activates PN (e.g. Bratt, 1999). More tests of

AR's role as a predictor of PN are required for theory verification and, again, not measuring a construct that seems to be theoretically accepted is a missed opportunity.

Just as common as omission of variables from models is addition of variables or relationships between existing constructs. It is easier to see how these changes develop understanding. For example, as well as predicting PN, AR has been shown to directly influence behaviour (Guagnano *et. al.*, 1995; Tanner, 1999). ESB research has begun to provide evidence for this effect, suggesting that Schwartz's (1977) theoretical structure could perhaps be modified, although more studies could still test AR's indirect effect.

One notable development of Schwartz's theory is Stern *et. al.*'s (1999) value-belief-norm (VBN) model, in which AC is antecedent to AR (*Figure 4.3*). This causal order was tested in three reviewed studies (Black *et. al.*, 1985; Guagnano *et. al.*, 1995; Stern *et. al.*, 1986) and supported in each. Moreover, variables "in this model may also have direct effects... on variables more than one level downstream" (Stern *et. al.*, 1999, 84). Indeed, AC has been shown to influence PN (Black *et. al.*, 1985; Bratt, 1999; Hunecke *et. al.*, 2001; Nordlund & Garvill, 2002; Stern *et. al.*, 1986; Stern *et. al.*, 1999) and AR to influence behaviour (Guagnano *et. al.*, 1995; Tanner, 1999). The VBN model also extends its causal chain back as far as values: "the regard that something is held to deserve; [its] importance or worth" (Soanes and Stevenson, 2004). Altruistic values are assumed to underpin PN (Schwartz, 1977) because people only feel moral obligation to perform particular actions when those actions are perceived as means of safeguarding something of 'importance or worth' (e.g. the non-human environment). Acceptance of the NEP (Dunlap & Van Liere, 1978) – which "measures awareness of very general adverse consequences of environmental conditions" (Stern *et. al.*, 1999) – links these general values to the more specific beliefs captured by AC. These features of the VBN model, alongside the lack of evidence for AC and AR's proposed moderating functions where tested, mark out Stern *et. al.*'s (1999) work as the type of empirically-justified theory development that arises from and contributes to cumulative understanding.



*Figure 4.3* Causal order in Stern *et. al.*'s (1999) VBN model

The same might be said of Bamberg & Schmidt (2003) and Oom Do Valle *et. al.*'s (2005) combined NAT/TPB models. Indeed, there is empirical support for SN's addition to NAT (Bratt, 1999; Hunecke *et. al.*, 2001), PBC's (or at least some measure of perceived constraints on behaviour) addition to NAT (Tanner, 1999) and PN's addition to the TPB (Flannery & May, 2000; Harland *et. al.*, 1999). Harland *et. al.* (*ibid.*) note that the TRA's predecessors included PN, but it was removed after correlating so strongly with BI that it did not add to explanation of behaviour. Schwartz (1977, 227), however, states that "personal norms are experienced as feelings of moral obligation, not intention". The difference between the two is empirically demonstrated by PN-BI effects reviewed here (e.g. Harland *et. al.*, 1999; Nordlund & Garvill, 2003). Moreover, from a theoretical viewpoint, adding PN to the TPB should increase normative coverage (Ajzen 1991a; 2001); accounting for internal and external norms. Although Schwartz (1977) argued that SN's effect on behaviour should be entirely mediated by PN, Oom Do Valle *et. al.* (2005) and Harland *et. al.* (1999) show that this is not the case and that PN's addition to the TPB raises explained variance in BI and behaviour.

#### 4.6.4 Reporting

Three reporting issues were highlighted in section 4.5.4; failure to provide reliability statistics for multi-item scales (e.g. Flannery & May, 2000), failure to provide item details (e.g. Kalafatis *et. al.*, 1999) and failure to provide *p* values (e.g. Stern *et. al.*, 1999).

The exact wording of items is essential in order to assess whether operational definitions match theoretical definitions and are comparable across studies, while scale reliabilities and *p* values allow for judgements on the coherence of measures and the statistical significance of findings. Wright (2003, 133) remarks that data should "tell a story". Without such basic details as these, stories are incomplete.

### 4.7 Conclusions

This review permits conclusions concerning knowledge of NAT the TPB as applied to ESB and general issues of research design and reporting. Although in some ways the variety of theoretical and operational definitions and proposed effects for each construct suggests confusion, there are several issues on which micro-level analysis reveals incremental advances in understanding. Many have implications for future research, as noted in the following points.



- Intentions seem to be better predictors of behaviour than desires or self-predictions. Desire measures should probably be avoided in BI scales, as what people want to do may be unrelated to what they can do.
- Single-item ATT measures reliably predict BI, but multi-item measures provide information on *why* people see a behaviour as positive or negative.
- ATT measures do not perform well as direct predictors of behaviour, supporting Ajzen's (1991a) assertion that BI mediates this relationship.
- PBC is a reliable predictor of BI and behaviour, as Ajzen (Ibid.) proposed.
- PBC seems to be multi-dimensional, accounting for perceived ease/difficulty, volitional control, self-efficacy and context. Measures could usefully tap each of these perceptions.
- SN items referencing 'important others' reliably predict BI, although with generally weaker effects than ATT or PBC. This reflects Armitage & Conner's (2001) findings across behavioural domains.
- Few studies measure descriptive norms but the evidence suggests that more should do so as they appear to influence ESB.
- SN and PN overlap to an extent, but PN does not completely mediate SN-BI or SN-behaviour effects.
- PN reliably predicts behaviour, suggesting that people often see ESB as having a moral aspect.
- PN also performs well as a predictor of BI.
- More studies could measure AR to reach consensus on how this should be done. The accepted theoretical definition as personal responsibility for specific acts seems to suggest an appropriate operational definition.
- There is some evidence of the AR-PN effect postulated by Schwartz (Ibid.), but more studies should test this relationship.
- The same applies to AR's proposed moderating effect on the PN-behaviour relationship, which is as yet unconfirmed in ESB research.
- There is, however, evidence of direct AR-behaviour effects not proposed by Schwartz (Ibid.). This supports Stern *et. al.*'s (1999) VBN model causal order.
- AC's direct effect on AR also supports this theoretical development.
- Both action- and condition-focused AC measures reliably predict PN.
- There have been few tests of AC's proposed moderating effect on the PN-behaviour relationship. What evidence there is does not support this effect, but more is needed before firm conclusions can be drawn.

Moving away from the construct level, the review aimed to ascertain which of the theories examined is most applicable to ESB. Judgements on this were difficult. The level of explained variance in ESB provided by each theory is similar, averaging around 40%. This is an approximate comparison, since the reviewed studies had different sample sizes, used models with different numbers of regressors and rarely tested NAT or the TPB's original formulations. Nonetheless, 'back-of-the-envelope' comparison of  $R^2$  values suggests that there is little to choose between them in terms of ability to explain ESB and ESB intentions. Both theories perform well compared to models included in Hines *et. al.*'s (1987) meta-analysis of ESB studies, which found an average explained variance level nearer to 35%. Thus, overall one can say that both NAT and the TPB seem to capture some motives for ESB and should be viewed as complementary.

The review also aimed to discover whether there are specific ESBs or research settings to which one theory is most applicable. However, because most behaviours were examined by few studies, this question was also unanswerable on the basis of research assessed here. Even recycling and travel behaviour, which were investigated by several studies, could not be more closely associated with the motives captured by one of the two theories. This was largely because of variation in research designs. NAT and the TPB have been expanded to include a variety of additional variables, making true comparison impossible. As argued in section 4.6.1.2, this can only be achieved by testing different models as explanations of the same outcome using the same sample; an approach that is rare.

From the point of view of cumulative understanding, perhaps the most important conclusion echoes Stern's (2000) suggestion that ESB research should integrate some of the many theories that have been applied to such behaviour. There is empirical support for PN's addition to the TPB as a predictor of BI; a development on which Ajzen (1991a; 2001) himself has speculated. Similarly, adding SN and PBC to NAT models increases explained variance. Some researchers have begun to develop theory-based integrated models (e.g. Bamberg & Schmidt, 2003; Oom Do Valle *et. al.*, 2005; Stern *et. al.*, 1999) and have applied them to particular behaviours. These models could now be tested for various ESBs in various settings so that their generalisability can be assessed.

Comparing research reviewed here with that reviewed in Chapter 3, it is notable that the only studies included in this chapter that examined affect are travel studies which were also discussed in the previous chapter (e.g. Bamberg & Schmidt, 2003; Steg, 2005). Affect may be particularly pertinent to travel and other ESBs might be less associated with 'subjectively experienced feeling' (Colman, 2001), but empirical work is needed to test this. The same could be said of social-symbolic motives. Do people perform 'public sphere' pro-environmental behaviours (Stern *et. al.*, 1999) to demonstrate environmentalist credentials? Neither NAT nor the TPB explicitly addresses such questions. They both imply an individualist attitude-behaviour approach and while this clearly goes some way towards explaining ESB,  $R^2$  values in the .40 range illustrate that much explanation remains to be done. Habit is another influence beyond the purview of NAT and the TPB and while a few researchers have included this variable in expanded versions of these models (e.g. Bamberg & Schmidt, 2003), it warrants further attention.

Such is the state of knowledge on NAT and the TPB's ability to explain ESB, but what can be done to ensure that future research actively contributes to a cumulative understanding? This review suggests various steps.

Research reports should provide all information that is necessary for interpretation of results. Attention should also be paid to research designs. The literature provides examples of constructs being conflated so that it is impossible to isolate the influence of one variable on another. It is easier to interpret results when one scale measures one construct. In addition, operational definitions should be consistent with theoretical definitions. It is confusing to find a construct being conceptualised in one way and measured in another. It is equally confusing to find a construct being given a label that is commonly applied to some quite different variable, as with Stern *et. al.*'s (1986) non-personal 'PN'. It is helpful to readers if authors demonstrate awareness of terms' common uses and avoid applying them in unusual ways.

Some degree of consistency is also desirable in the roles specified for constructs and when an established behavioural theory is developed by some change to its structure, a rationale should be provided. Of course, the advancement of understanding does require the development of new theories and models, but this should not be arbitrary. If studies are to be comparable, which they must be if we are to accumulate a coherent

body of knowledge, they cannot be based on speculatively-chosen constructs. Finally, there is a need for methodologically-oriented studies that test alternative operational definitions of the same constructs. It is appropriate to end this chapter with Stern *et al.*'s (1999, 85) comment that "most work on public environmental attitudes and behavior does not build into a cumulative understanding because too little attention has been given to systematic theory and the comparative testing of alternative theoretical models". Comparative testing of NAT and the TPB was precisely the aim of the first empirical study undertaken for this thesis, which is reported in the next chapter.



# Chapter 5

## Study 1: a quantitative study of commuters' car use intentions

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### 5.1 Abstract

This chapter reports a quantitative study of influences on drivers' intentions to reduce or maintain their car use for commuting to De Montfort University (DMU). Schwartz's (1977) norm-activation theory (NAT) and Ajzen's (1991; 1991a) theory of planned behaviour (TPB) were its theoretical bases. Various analyses were conducted using the same sample. First, the theories' ability to explain car use intentions was compared using logistic regression ( $n = 312$ ). NAT explained more variance. Second, a model using constructs from both theories was tested. This explained more variance than either individual model. A combined ascription of responsibility/personal norm variable (AR/PN) from NAT and perceived behavioural control (PBC) from the TPB were the only two statistically significant regressors. Third, contextual variables were added to NAT and TPB constructs, raising explained variance again (and raising adjusted  $R^2$ , which applies a penalty to compensate for additional predictors). AR/PN and PBC remained significant and several physical-contextual and socio-demographic variables also had significant effects on intentions. Finally, interactions between predictors were examined. AR/PN's influence on intentions was partially moderated by PBC, bicycle ownership, carriage of passengers when commuting, perceived cost of commuting by car and journey time from home to DMU. Findings are discussed in light of previous travel research and conclusions drawn about theoretical implications and implications for DMU transport policy, which aims to alter "the current modal split of travel to the University in favour of more sustainable modes of transport than the private car" (DMU, 2005).

### 5.2 Theoretical background and study aims

#### 5.2.1 Models tested in the study

Chapter 3 showed that travel mode choice is influenced by many factors. Several are captured by the theories examined in Chapter 4; Schwartz's (1977) norm-activation theory (NAT) and Ajzen's (1991; 1991a) theory of planned behaviour (TPB). Due to their prevalence in environmentally-significant behaviour (ESB) research (Matthies, 2003) and successful application to travel behaviour (e.g. Bamberg & Schmidt, 2003), these theories were applied in the study reported here.

Although NAT and the TPB may partially explain modal choice, Chapter 3 also highlighted influences that are beyond these theories' purview. The importance of context (e.g. Gatersleben, 2003) and affect (e.g. Steg, 2005) was especially apparent. The present study examined contextual factors, but not affect. This could be seen as a limitation, but the principal objective was to obtain a clear picture of NAT and the TPB's comparative explanatory power, in their original formulations. Affective motives were, however, examined in study 2 (see Chapter 6).

This study compared NAT and the TPB's ability to explain drivers' intentions to maintain or reduce their car use for commuting to De Montfort University (DMU). It also tested a model using constructs from both theories. This approach has been shown to increase explanatory power in travel studies (e.g. Bamberg & Schmidt, 2003; Harland *et al.*, 1999), reflecting the assumption that a person may have altruistic and non-altruistic motives for one behaviour. Neither NAT nor the TPB explicitly accounts for this.

A fourth model comprised constructs from NAT and the TPB plus measures of actual and perceived context that were assumed – based on the literature review presented in Chapter 3 – to be potential influences on commuting behaviour. The TPB's perceived behavioural control (PBC) construct "denotes subjective degree of control over performance of" a behaviour (Ajzen, 2002, 668) and is, therefore, likely to capture perceptions of at least some relevant contextual conditions. However, as Ajzen (*Ibid.*) notes, PBC may not reflect *actual* control. Contextual conditions (and perceptions thereof) were included in the fourth model to test the idea that direct effects of context on behavioural intention (BI) may be distinguishable from PBC's influence.

### 5.2.2 *Intention as an outcome variable*

Two points must be made about the regression outcome variable for this study, intentions to reduce or maintain car use for commuting among people who usually drove to DMU. Firstly, 'car use intentions' is used as shorthand for this dichotomous variable. Secondly, investigating BI is arguably less useful than investigating behaviour. Actions, not intentions, have environmental impacts. Furthermore, numerous factors may mediate BI-behaviour relationships, meaning that intentions do not always lead to actions. Nonetheless, BI often does explain ESB (e.g. Boldero, 1995) and other behaviours (Armitage & Conner, 2001). Accordingly, it is common for TPB studies to employ BI as an outcome variable (e.g. Flannery & May, 2000).

Use of BI as an outcome variable in NAT models raises different issues because Schwartz's (1977) theory does not include the construct. Research shows, however, that personal norms (PN) explain BI (see Chapter 4, section 4.5.3.1). This accords with Schwartz's (Ibid.) differentiation of PN from BI, in that PN can be neutralised before intentions form. In this study – comparing NAT and the TPB – comparisons had to be made on the basis of explaining the same outcome. Due to the difficulty of gathering prospective behavioural data, car use intention was chosen. This is a limitation, but the study does add to previous work that has examined influences on drivers' intentions to maintain or reduce their car use (e.g. Harland *et. al.*, 1999; Matthies *et. al.*, 2002).

To summarise, the study had the following aims:

- to compare the explanatory power of NAT and the TPB for car use intentions,
- to compare the explanatory power of each model with a model comprising constructs from NAT and the TPB,
- to assess whether adding contextual variables to a model comprising constructs from NAT and the TPB improved explanation of car use intentions.

### 5.2.3 Hypotheses

Based on previous research, four hypotheses were developed.

1. Congruent with NAT, variance in drivers' car use intentions will be explained by awareness of consequences (AC), ascription of responsibility (AR) and PN.
2. Congruent with the TPB, variance in drivers' car use intentions will be explained by attitudes toward commuting by car (ATT), PBC and subjective norms (SN).
3. A model comprising constructs from NAT and the TPB will explain more variance in drivers' car use intentions than either individual model.
4. Addition of contextual variables (see *Table 5.3*) to a model comprising constructs from NAT and the TPB will explain more variance in drivers' car use intentions than psychological variables alone.

## 5.3 Method

### 5.3.1 Participants

Participants were staff and students at DMU's three campuses in Leicester, three in Bedford and one in Milton Keynes, all of which were open when data were collected



(see Chapter 1, section 1.5). This population was divided into academics, administrative support staff, non-administrative support staff, undergraduates and postgraduates, although quotas were not set for groups or locations. During the study DMU had 18,515 attending students (14,946 undergraduate and 3,569 postgraduate) and 3,380 staff; a total population of 21,895. Staff with DMU email accounts (3,180) were sent a message by DMU's Green Travel Group (GTG), with which the study was undertaken, stating that a travel questionnaire was online and requesting its completion. A reminder was sent six weeks later. Staff without email accounts (200 people in cleaning and maintenance posts) received paper questionnaires and covering letters. Eight hundred students were approached on a convenience basis across campuses. Participants were offered the opportunity to enter a £100 prize draw on return of a completed questionnaire and were assured of confidentiality. Staff data were collected between April 1<sup>st</sup> and May 20<sup>th</sup> 2003 and student data between April 1<sup>st</sup> and April 3<sup>rd</sup> 2003. One thousand and fourteen completed questionnaires were returned, representing 4.6% of DMU's population and 24.3% of those approached to participate. Socio-demographic details of the sample are shown in *Table 5.1* (the column headed 'Drivers' provides additional information explained in section 5.4.1.1). The majority of respondents were female. Twenty to 29 was the most represented age group. Administrative support staff was the most represented job type. There were more full-than part-time respondents and incomes were generally at the lower end of the range.

### 5.3.2 *Questionnaire pre-testing*

The questionnaire was developed using Robson's (2002) pre-testing process. Drafts were provided to members of each participant group (six academics, four admin support staff, four non-admin support staff, three undergraduates and four postgraduates), drawn from all campuses. They were selected by 'snowball sampling', whereby the researcher chooses the first person, who suggests another, and so on (*ibid.*). The number of people is unspecified at the outset and sampling continues until volunteers provide no new information. Here, the first person was an academic known to the researcher through DMU's gym, who worked in a different faculty.

Each volunteer completed the questionnaire in the researcher's presence, verbalising their reactions to all items. The researcher then identified items regarded as ambiguous, intrusive, repetitive, or otherwise difficult. Consistently-problematic items were revised. For example, some were altered to reflect the fact that respondents could

spend equal amounts of time at more than one DMU campus and the question “What form of transport do you usually use for the main part of your journeys to and from university?” was amended to “What form of transport do you usually use for the main part of your journeys – in terms of distance – to and from university?” because six people requested clarification of “main part”.

		Full sample (n = 1,014)		Drivers (n = 539)	
		n	%	n	%
<b>Gender</b>	female	616	60.7	344	63.8
	male	343	33.8	170	31.5
	missing	55	5.4	25	4.6
<b>Age</b>	under 20	47	4.6	6	1.1
	20-29	258	25.4	68	12.6
	30-39	199	19.6	119	22.1
	40-49	231	22.8	158	29.3
	50-59	193	19.0	139	25.8
	60 or over	36	3.6	27	5.0
	missing	50	4.9	22	4.1
<b>Job type</b>	academic staff	265	26.1	166	30.8
	admin support staff	325	32.1	207	38.4
	non-admin support staff	148	14.6	97	18.0
	undergraduate	199	19.6	43	8.0
	postgraduate	32	3.2	8	1.5
	missing	45	4.4	18	3.3
<b>Full- or part-time</b>	full-time	805	79.4	404	75.0
	part-time	156	15.4	110	20.4
	missing	53	5.2	25	4.6
<b>Income</b>	under £10,000	270	26.6	94	17.4
	£10,000-£19,999	291	28.7	165	30.6
	£20,000-£29,999	163	16.1	98	18.2
	£30,000-£39,999	133	13.1	90	16.7
	£40,000 or over	62	6.1	44	8.2
	missing	95	9.4	48	8.9

Table 5.1 Socio-demographic comparison of full sample and drivers

### 5.3.3 Measures

Items tapping psychological variables are shown in Table 5.2. These were developed based on the literature reviews presented in Chapters 3 and 4. All items except the BI measure – which had response options *Increase/Stay the same/Reduce* – used scales with response options *Disagree strongly/Disagree/Neither agree nor disagree/Agree/Agree strongly*. *Disagree strongly* was coded as 1 and *Agree strongly* as 5. An *Unsure* option was also provided, which was coded as missing. Items marked \* were reverse coded for analysis. The questionnaire is provided in Appendix 1.

Construct	Theory	Item
Awareness of consequences (AC)	NAT	My family and I are affected by pollution from cars *I don't believe that environmental problems like global warming are caused by car use Avoiding car use will help to solve wider environmental problems like global warming My transport choices can have an impact on the environment I can help to solve my town/city's transport problems by avoiding car use I contribute to pollution [when travelling by car to DMU]
Ascription of responsibility (AR)	NAT	I feel personal responsibility for helping to solve my town/city's transport problems *I don't feel any personal responsibility for causing my town/city's transport problems
Personal norm (PN)	NAT	I feel morally obliged to avoid using the car to get to university
Attitude towards own car use for commuting (ATT)	TPB	My usual form of transport [car] is... pleasant/*uncomfortable/convenient/flexible/safe
Perceived behavioural control (PBC)	TPB	*It would be difficult for me to reduce my car use when getting to university Other means of travelling to the university are available to me I am able to use forms of transport other than the car to get to university
Subjective norm (SN)	TPB	My friends at DMU think that I shouldn't drive to get to university *Most people I know at university don't care how I travel to DMU
Behavioural intention (BI)	TPB	Do you plan to change the amount that you use the car to travel to DMU during the next 12 months?

Table 5.2 Items tapping psychological variables

Table 5.2 shows different numbers of items tapping different constructs. This was because items had to be approved by DMU's Transport Co-ordinator on the GTG's behalf and some proposed items were discarded during discussions. The Co-ordinator was wary of including too many psychological items because they would have lengthened the questionnaire, possibly discouraging potential respondents. Those that were retained were thought by the Co-ordinator to be useful to the GTG as well as for the present research, hence, for example, the comparatively large number of AC items.

Table 5.3 shows two types of contextual items; physical and socio-demographic. They were developed by the GTG to gather data on staff and student travel and were considered appropriate as contextual measures for this study's purposes. It is acknowledged that many actually measured *perceived* context. Nonetheless, these were useful because, as argued in Chapter 3, section 3.3.2, many aspects of context must be interpreted and it is individuals' interpretations that dictate how context influences behaviour (and/or intentions). *Unsure* was again coded as missing. To obtain a measure of actual contextual conditions, participants' journey distances were calculated using home and campus postcodes, where provided. Distances were calculated using an Internet direction finder (Multimap, 2003).

Item	Response options
Are you...?	Male/Female
How old are you?	Under 20/20-29/30-39/40-49/50-59/60 or over
Are you...?	Academic staff/Admin support staff/Non-admin support staff/Undergraduate/Postgraduate
Are you...?	Full-time/Part-time
What is your income (gross per year)?	Under £10,000/£10,000-19,999/£20,000-29,999/£30,000-39,999/£40,000 or over
Do you own a bicycle?	Yes/No
Is the area that you live in served by buses?	Yes/No/Unsure
Does the area that you live in have a train service?	Yes/No/Unsure
Travelling to DMU [by car] is expensive	Disagree strongly/Disagree/Neither agree nor disagree/Agree/Agree strongly/Unsure
How long does it usually take you to get from home to your campus?	0-10 minutes/11-20 minutes/21-40 minutes/41-60 minutes/Over 1 hour
How long does it usually take you to get home from your campus?	0-10 minutes/11-20 minutes/21-40 minutes/41-60 minutes/Over 1 hour
How far is your home from your campus?	0-2 miles/2.1-5 miles/5.1-10 miles/10.1-20 miles/Over 20 miles/Unsure
How many other people normally travel in your car with you on the way to DMU?	None/1 other/2 others/More than 2 others
Do you combine your journey with other trips, such as shopping, or dropping off children?	Yes/No

*Table 5.3 Items measuring contextual variables*

## 5.4 Data analysis

The procedures reported in this section are largely based on those suggested by Field (2000) and Bryman & Cramer (2001), although with some additions from other sources as cited.

### 5.4.1 Principal components analysis (PCA)

Using SPSS, a PCA of psychological variables was carried out to check that items designed for use in multi-item scales were sufficiently correlated. PCA examines correlations between variables, grouping those that are highly correlated into factors that are uncorrelated or weakly correlated with one another. It “achieves parsimony by explaining the maximum amount of common variance in a correlation matrix using the smallest number of explanatory concepts” (Field, 2000, 423).

Factors are “independent linear combinations” of the original variables (Brooks, 2002, 220). If the variables entered into the PCA are denoted by  $x_1, x_2, \dots, x_k$  and the factors denoted by  $f_1, f_2, \dots, f_k$ , then factors are described by the equations

$$f_1 = \alpha_{11}x_1 + \alpha_{12}x_2 + \dots + \alpha_{1k}x_k$$

$$f_2 = \alpha_{21}X_1 + \alpha_{22}X_2 + \dots + \alpha_{2k}X_k$$

$$\dots \quad \dots \quad \dots \quad \dots$$

$$f_k = \alpha_{k1}X_1 + \alpha_{k2}X_2 + \dots + \alpha_{kk}X_k$$

where  $\alpha_{ab}$  are the coefficients (or 'factor loadings') representing the loading of the  $b^{\text{th}}$  variable on the  $a^{\text{th}}$  factor. Although PCA produces as many factors as variables are entered, the factors are in descending order of importance. Assuming some correlation between the variables entered (see *Table 5.10*), later factors account for so little variance that they can be discarded. Thus, PCA achieves parsimony by identifying factors that contribute little to explained variance in the items entered.

#### 5.4.1.1 Variables included in the PCA

As well as items listed in *Table 5.2*, five items measuring acceptance of the new ecological paradigm (NEP) (Dunlap *et. al.*, 2000) were included, which were not used in analyses reported here. Beliefs captured by an earlier version of the NEP (Dunlap & Van Liere, 1978) have been likened to NAT constructs; particularly AC. Stern, Dietz and Guagnano (1995, 739) found NEP beliefs and AC to be "indistinguishable psychometrically and in terms of their relationship to behavioural intention", but later work by the same team (Stern *et. al.*, 1999) empirically differentiates the two, showing NEP to be AC's antecedent. The present analysis, in which NEP and AC were differentiated by the PCA, supports this latter interpretation (i.e. NEP and AC items loaded highly on different factors). This was expected, as the AC items tapped more specific beliefs than the NEP's "measure of endorsement of a fundamental paradigm or worldview" (Dunlap *et. al.*, 2000, 427). NEP items are shown in *Table 5.4*.

As the study examined drivers' intentions, analysis was restricted to participants who stated that they drove to DMU at least four days per week and expressed intentions to maintain or reduce their car use for commuting during the year following the survey ( $n = 539$ ). (Only 13 drivers expressed intentions to increase car use; too few for this to be used as a regression outcome variable. These people were excluded from further analyses.) This meant that data from 475 respondents went unused in analyses reported here, but DMU's interest was in changing drivers' behaviour and this aim underpinned the present research. Eighty-two per cent of the drivers included ( $n = 441$ ) intended to maintain car use, while 18% ( $n = 98$ ) intended to reduce it. For comparison, in a recent UK survey (DEFRA, 2002), 39% of respondents claimed to have "cut down

the use of a car for short journeys (e.g. school, work, local shops, etc.)" during the last year. It is notable that the DEFRA survey suggests that twice the percentage of drivers had reduced their car use as intended to do so among the present sample, although answers applied to a wider range of journeys and did not indicate by how much people had cut down. Socio-demographic details of the drivers group are shown in *Table 5.1*. Of 462 respondents who were not classified as drivers, 189 reported commuting mainly on foot, 121 by bus, 53 by bicycle, 44 by train, 38 as car passengers, 10 by motorcycle and there were seven missing responses. As proportions of the full sample ( $n = 1,014$ ), these figures equate to 18.6% pedestrian, 11.9% bus, 5.2% bicycle, 4.4% train, 3.7% car passenger, 1.0% motorcycle and 0.7% missing.

In light of potential implications for DMU transport policy, tests were performed to assess the significance of socio-demographic differences between drivers and the full sample. (Interventions aimed at socio-demographic groups containing significantly more drivers may be most effective. See also Chapter 7, section 7.4.) This meant using two-unrelated-samples tests. For the ordinal variables age and income, Mann-Whitney U tests were used to test the null hypothesis that means for drivers and the full sample were equal. If the  $z$  statistic produced by the test is significant ( $p < .05$ ) this hypothesis can be rejected (Bryman & Cramer, 2001). For age  $z = -6.546$  ( $p < .001$ ) and for income  $z = -4.084$  ( $p < .001$ ), indicating that drivers were significantly older and higher earning than the full sample.

For the nominal variables full- or part-time status, gender and job type,  $\chi^2$  tests were used to test the null hypothesis that comparison groups contained the same number of cases in each category of the test variable. If  $\chi^2$  is non-significant ( $p > .05$ ), there is no significant difference between groups. There was no significant gender difference ( $\chi^2 = 1.069$ ,  $df = 1$ ,  $p = .301$ ), but drivers were significantly more likely to be staff than students ( $\chi^2 = 43.745$ ,  $df = 4$ ,  $p < .001$ ) and part-time than full-time ( $\chi^2 = 6.050$ ,  $df = 1$ ,  $p = .014$ ).

#### 5.4.1.2 Data screening

Before examining the PCA solution, data were screened to assess their suitability for PCA. Bryman & Cramer (Ibid.) propose that there should be at least five participants per variable in order to produce a result replicable with another sample from the

population. After listwise deletion of missing responses ( $n = 82$ )  $n = 457$ . With 24 items (nine NAT, 10 TPB, five NEP), there were 19 participants per variable.

The determinant of the correlation ( $r$ ) matrix was examined to check for multicollinearity of items. The determinant is obtained by subtracting the product of the off-diagonal elements from that of the diagonal elements (Sydsaeter and Hammond, 1995).

Assuming no random sampling error, if the determinant = 0, changes in the value of one variable are identical to changes in the value of another and those variables are, therefore, not independent of one another. If the determinant  $\neq 0$ , changes in the value of one variable are not mirrored exactly by changes in another, so those variables are at least partially independent. In the present context, some random sampling error must be assumed, so a determinant  $\neq 0$  may be insufficient to indicate variables' independence. The determinant = 0.0001203. Although close to 0, this exceeded Field's (2000) recommended minimum of 0.00001. Multicollinearity was not, therefore, assumed to be a problem. This was supported by inter-item correlations in the  $r$  matrix. Field (Ibid.) suggests that only values  $\geq .80$  are problematic, but the strongest was  $r = .733$  ( $p < .001$ ), between two ATT items tapping perceived convenience and flexibility of car use. Most were much weaker and many were non-significant (at 0.5 level).

SPSS produces an anti-image matrix, which includes measures of sampling adequacy for each variable. In an image matrix, the elements are regression coefficients for each variable regressed on all the others. The anti-image matrix contains residuals from these regressions. Its elements indicate the proportion of variance in each variable that is unrelated to other variables in the analysis (Rummel, 1977). The central diagonal of the anti-image matrix shows the measures of sampling adequacy. Kaiser (1974), who developed this test, suggests that values of these elements should be  $> .50$  if sample size is adequate, indicating that more than half of the variance in each variable is unrelated to other variables. This was the case for the present data (range = .59 to .94).

Finally, the reproduced  $r$  matrix was examined for non-redundant residuals, defined in SPSS as  $> .05$ . This matrix is based on the PCA model, rather than actual data.

Differences between elements in the  $r$  and reproduced  $r$  matrices indicate the residuals from the model and, therefore, its accuracy. Less than 50% of residuals should be non-redundant if the model is a reasonable approximation to the data (Field, 2000). Here, 26% were non-redundant. Data therefore met each criterion for PCA's suitability.



#### 5.4.1.3 Factor extraction

An initial PCA was performed and factors with eigenvalues  $> 1$  (Kaiser's criterion) were extracted. A scree plot was also produced (Figure 5.1). Oblique rotation was used because factors were expected to correlate. For example, one might expect correlation between SN and PN (see Chapter 4, section 4.5.2.4). Oblique rotation allows for this, while the alternative orthogonal rotation enforces independence of factors. While this has the advantage of giving factors that provide no redundant information, it may not reflect conceptual links between variables (Bryman & Cramer, 2001).

Oblimin was selected as the method of oblique rotation. Kline (1994) identifies this as the most reliable method since it is best able to provide the expected solution when factors are already known.

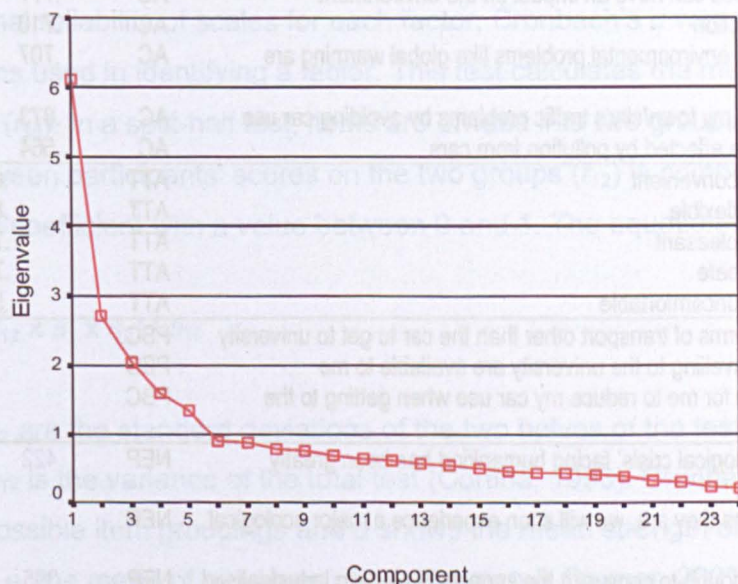


Figure 5.1 Scree plot from PCA of NAT, TPB and NEP items

Based on Kaiser's criterion, the PCA yielded a five-factor solution explaining 57.6% of variance in the items entered. The scree plot, however, suggested a six-factor solution (levelling off after this point).

Another PCA was run, specifying a six-factor solution. Both solutions were examined to assess how well they reflected the NAT and TPB structures (Hammond, 2000; Dancey and Reidy, 2002). The six-factor solution was more theoretically coherent, more clearly differentiating NAT and TPB constructs from each other and from NEP beliefs. Most



notably, the five-factor solution had all NAT items loading highly on one factor, while the six-factor solution separated AC from AR and PN. This solution was accepted. To check the solution, another PCA was run using Promax oblique rotation (Kline, 1994); an alternative method provided in SPSS. Results were very similar to the Oblimin rotation. The same factors emerged, with only minor differences in factor loadings.

Table 5.4 shows the rotated structure matrix for the six-factor Oblimin solution and includes all loadings > .300 (or < -.300). Loadings of items used to identify each factor are in normal type. Loadings of items not used in factor identification are feint. Factors

Item	Construct	Factor loadings > .300					
		1	2	3	4	5	6
Avoiding car use will help to solve wider environmental problems like global warming	AC	.779			-.467		-.342
My transport choices can have an impact on the environment	AC	.777					-.341
I contribute to pollution	AC	.710					
I don't believe that environmental problems like global warming are caused by car use	AC	.707			-.525		
I can help to solve my town/city's traffic problems by avoiding car use	AC	.673		.301	.360		-.626
My family and I are affected by pollution from cars	AC	.564			-.340	.363	-.356
Driving to DMU is convenient	ATT		.826				
Driving to DMU is flexible	ATT		.801				
Driving to DMU is pleasant	ATT		.753				
Driving to DMU is safe	ATT		.724				
Driving to DMU is uncomfortable	ATT		.577				
I am able to use forms of transport other than the car to get to university	PBC			.899			
Other means of travelling to the university are available to me	PBC			.894			
It would be difficult for me to reduce my car use when getting to the university	PBC			.784			
The so called 'ecological crisis' facing humankind has been greatly exaggerated	NEP	.422			-.761		
If things continue as they are, we will soon experience a major ecological catastrophe	NEP				-.760		-.334
Nature is robust enough to cope with the impacts of modern industrialised nations	NEP	.305			-.752		
The Earth is like a spaceship with limited room and resources	NEP				-.725		
Humans are severely abusing the environment	NEP	.331			-.701		
Most people I know at university don't care how I travel to DMU	SN					.800	
My friends at DMU think that I shouldn't drive to get to university	SN					.662	.425
I feel personal responsibility for helping to solve my town/city's traffic problems	AR	.475			-.319		-.773
I feel morally obliged to avoid using the car to get to university	PN					.302	-.744
I don't feel any personal responsibility for causing my town/city's traffic problems	AR	.488			-.420		-.689

Table 5.4 Rotated structure matrix from six-factor PCA solution

were identified as representing AC, ATT, PBC, NEP, SN and AR/PN. It is notable that not all items loaded on just one factor. While there was clear differentiation between

ATT, PBC and all other factors, other distinctions were less sharp. For example, the first, third and fifth NEP items loaded (albeit with values  $\leq .422$ ) on factor 1 (AC) as well as factor 4. Nonetheless, it was possible to identify conceptually-coherent factors from the highest-loading items on each. Again taking NEP as an example, all five items loaded on factor 4 with values  $\leq -.701$ , showing strong inter-correlation. The fact that AR and PN items loaded highly on the same factor (all loadings  $\leq -.689$ ) shows that drivers' feelings of responsibility and obligation regarding car use were strongly correlated. Drivers apparently did not differentiate between these constructs, so AR/PN was treated as a single latent variable in the following analyses.

## 5.4.2 NAT and TPB construct scales

### 5.4.2.1 Scale reliabilities

Internal reliability refers to whether a multi-item scale measures one underlying idea. To check the internal reliability of scales for each factor, Cronbach's  $\alpha$  was computed for each set of items used in identifying a factor. This test calculates the mean of all split-half reliabilities ( $r_{sh}$ ). In a split-half test, items are divided into two groups and the correlation between participants' scores on the two groups ( $r_{12}$ ) is computed and expressed as a coefficient with a value between 0 and 1. The equation for  $r_{sh}$  is

$$r_{sh} = (4r_{12} \times s_1 \times s_2) / s_{T2}$$

where  $s_1$  and  $s_2$  are the standard deviations of the two halves of the test (the two sets of items) and  $s_{T2}$  is the variance of the total test (Cortina, 1993). Cronbach's test examines all possible item groupings and  $\alpha$  shows the mean strength of all their relationships (i.e. the mean of all values of  $r_{sh}$ ) (Bryman & Cramer, 2001). Results for factors used in this study are in Table 5.5.

Scale	<i>n</i> items	<i>n</i> cases	average item inter-correlation	$\alpha$
AC	6	417	.430	.83
ATT	5	457	.438	.78
PBC	3	446	.612	.82
SN	2	433	.252	.42
AR/PN	3	446	.459	.70

Table 5.5 Scale reliabilities

ESB studies differ on the  $\alpha$  value above which internal reliability is acceptable. Some take  $\alpha \geq .40$  (e.g. Stern *et. al.*, 1986), others require  $\alpha \geq .70$  (e.g. Hunecke *et. al.*,

2001). Cortina (1993, 100) notes that “most recent studies that have used alpha imply that a given level, perhaps greater than .70, is adequate or inadequate without comparing it to the number of items in the scale.” This is certainly true in ESB research. The point is that  $\alpha$  is partly a function of number of items, as well as their inter-correlations. Cortina concedes, however, that “there seems to be no real metric for judging the adequacy of the statistic” (Ibid., 101). There is no rule based on number of items and their average inter-correlation that tells us when an  $\alpha$  value above a certain level really indicates ‘acceptable’ internal reliability. Cortina (Ibid.) does offer guidance though, suggesting that  $\alpha$  is less prone to artificial inflation with fewer items. He discusses problems with scales containing  $\geq 14$  items, so it was assumed that  $\alpha$  values for scales used here, which comprised six items or fewer, were suitable indicators of internal reliability.

Acceptability at  $\alpha \geq .70$  appears to be the most stringent criterion applied in ESB studies. This is also the level specified by Cortina (Ibid.), assuming few items. Hence .70 was used as the acceptability threshold in the present analysis. Reliabilities for all scales except SN met this criterion. Although beliefs about “friends at DMU” and “people I know at university” were not sufficiently correlated to form a reliable scale, this did not rule out the possibility of one or both variables predicting BI individually. The two SN items were, therefore, used as separate predictors in the analyses reported below.

#### 5.4.2.2 Scale scores

Participants' scores on reliable scales were computed by taking their mean score on items comprising each scale, so that all scores ranged from 1 to 5. For example, if somebody had scores of 2, 2 and 4 on the PBC items, their overall PBC score was 2.67 (the sum of item scores divided by number of items). Scores were computed for participants answering all items in a scale. Higher scores on AC, PBC and AR/PN indicated beliefs that, according to theory, should lead to increased odds of intending to reduce car use. For example, a high AC score indicated that a person identified negative consequences of car use. The same convention was used for the SN items. Conversely, low ATT scores were theoretically congruent with intending to drive less, representing negative evaluations of one's own car use. *Table 5.6* shows descriptive statistics for each variable.

Variable	<i>n</i>	Min	Max	Mean	SD	Variance
AC	417	1.33	5.00	3.490	.727	.529
ATT	457	1.80	5.00	4.257	.565	.319
PBC	446	1.00	5.00	2.420	1.061	1.126
AR/PN	446	1.00	5.00	2.685	.743	.552
My friends at DMU think that I shouldn't drive to get to university (SN1)	433	1.00	5.00	1.864	.783	.613
Most people I know at university don't care how I travel to DMU (SN2)	439	1.00	5.00	2.041	.787	.619

*Table 5.6* Descriptive statistics for NAT and TPB variables

PBC exhibited most variance (1.126), while ATT exhibited least variance (.319). Drivers' stated attitudes toward commuting by car were generally very positive ( $M = 4.257$ ). Mean PBC score (2.420) was low-to-moderate, indicating that drivers generally expressed low control over commuting mode choice, although the large variance (1.126) shows that some expressed much greater control. Mean AC score (3.490) was above the scale mid-point, indicating general awareness of driving's consequences. Mean AR/PN score (2.685) was below the mid-point. On the whole, drivers stated that they felt neither very responsible for, nor obliged to reduce, their car use. Nor, however, did they state absolutely no responsibility or obligation. The two SN items had the lowest means (1.864 and 2.041), indicating that drivers generally expressed little pressure from the specified referents to reduce their commuter car use.

#### 5.4.2.3 Comparing reducers' and maintainers' scale scores

*Table 5.7* and *Figure 5.2* show separate descriptive statistics for people who stated intentions to maintain and reduce their car use (hereafter 'maintainers' and 'reducers', respectively). The vertical bars in *Figure 5.2* show the variance for each variable, while the point in the middle of each bar shows the mean.

Intention (BI)	Variable	<i>n</i>	Min	Max	Mean	SD	Variance
Maintain car use	AC	338	1.33	5.00	3.415	.714	.509
	ATT	370	1.80	5.00	4.292	.574	.329
	PBC	360	1.00	5.00	2.305	1.020	1.040
	AR/PN	360	1.00	5.00	2.575	.696	.485
	SN1	353	1.00	4.00	1.813	.746	.556
	SN2	356	1.00	5.00	2.034	.779	.607
Reduce car use	AC	79	1.83	5.00	3.812	.701	.492
	ATT	87	3.00	5.00	4.108	.502	.252
	PBC	86	1.00	5.00	2.899	1.101	1.213
	AR/PN	86	1.33	5.00	3.147	.759	.577
	SN1	80	1.00	5.00	2.088	.903	.815
	SN2	83	1.00	5.00	2.072	.823	.678

*Table 5.7* Descriptive statistics for NAT and TPB variables for different intentions



Reducers' mean AC, PBC, AR/PN, SN1 and SN2 scores were higher, while their mean ATT score was lower than maintainers'. These findings are congruent with NAT and the TPB. Nonetheless, even reducers expressed very positive attitudes towards their own car use ( $M = 4.108$ ). It is also notable that stated anti-driving social pressure was uniformly low. The most marked differences were in mean AC, AR/PN and PBC scores.

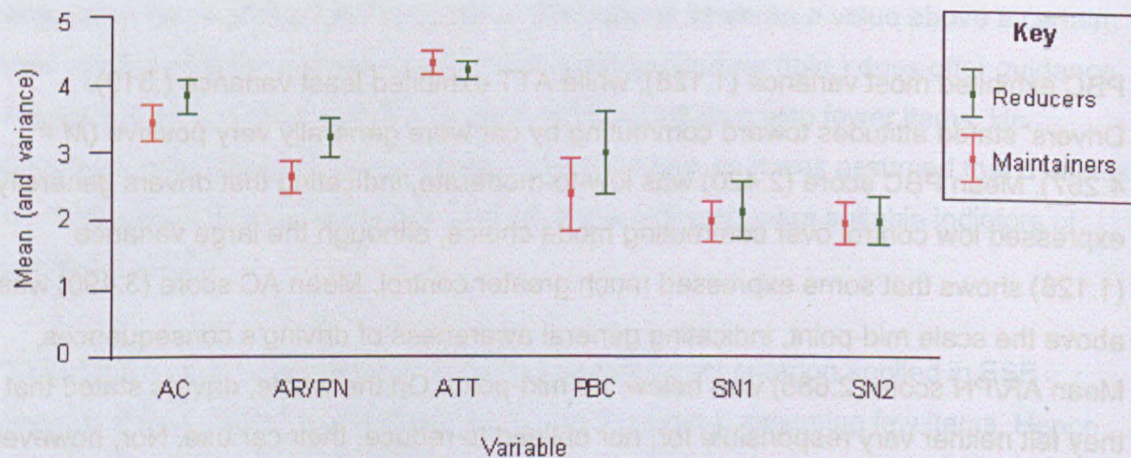


Figure 5.2 Maintainers' and reducers' means and variances on NAT and TPB variables

Mann-Whitney U tests were used to test the null hypothesis that reducers and maintainers had equal means for each variable (Table 5.8). Although scale data of this sort are routinely treated as continuous in psychological research (Bryman & Cramer, 2001), they are actually discrete, hence the use of this test.

	AC	ATT	PBC	AR/PN	SN1	SN2
Mann-Whitney U	9373.500	12672.000	10731.500	9172.500	11803.500	14545.500
z	-4.136	-3.114	-4.457	-5.936	-2.472	-.244
p (2-tailed)	.000	.002	.000	.000	.013	.807

Table 5.8 Differences between maintainers and reducers on NAT and TPB variables

There was no significant difference (at 0.5 level) for SN2, but there were significant differences for all other variables. Reducers had significantly higher scores on AC, PBC and AR/PN, expressed significantly greater (although still low) pressure against driving from friends at DMU and stated significantly less positive (although still very favourable) attitudes towards their own driving.

5.4.2.4 Scores' distributions

Because the choice of later statistical tests needed to take account of data distributions, Kolmogorov-Smirnov (KS) tests were conducted to test the null hypothesis that each NAT and TPB variable had a normal distribution (*Table 5.9*). This test was used because data were ordinal (Bryman & Cramer, 2001).

The KS test compares observed frequencies of values of a variable against a specified theoretical distribution; in this instance, a normal distribution. The *z* statistic is computed from the largest difference between the observed and theoretical distribution functions and the associated *p* value indicates whether observations could reasonably have come from the specified distribution. If  $p < .05$ , the difference between the observed and theoretical distributions is significant and the null hypothesis is rejected (Kinnear and Gray, 2000). Significant ( $p < .05$ ) statistics for all variables indicated that no NAT or TPB data were normally distributed.

Variable	<i>z</i> *	df
AC	.081	417
ATT	.116	457
PBC	.121	446
AR/PN	.116	446
SN1	.235	433
SN2	.304	439

\*all  $p < .001$

*Table 5.9* Kolmogorov-Smirnov tests for normality of NAT and TPB variable distributions

To further illuminate variables' distributions, histograms with normal curves were produced (*Figures 5.3a to 5.3f*). These reflect the descriptive statistics in *Table 5.6*. Drivers generally expressed little anti-car social pressure, illustrated by pronounced positive skewness (i.e. means higher than medians) in *Figures 5.3e and 5.3f*. They expressed low-to-moderate PBC (although *Figure 5.3d* shows spikes in the distribution at 1 and just above the scale mid-point of 3). They also expressed moderate AC and AR/PN (*Figures 5.3a and 5.3c*, respectively) and very favourable attitudes towards their own car use (illustrated by very negative skewness in *Figure 5.3b*).



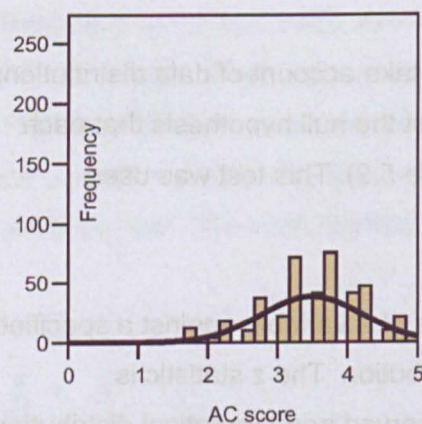


Figure 5.3a AC distribution

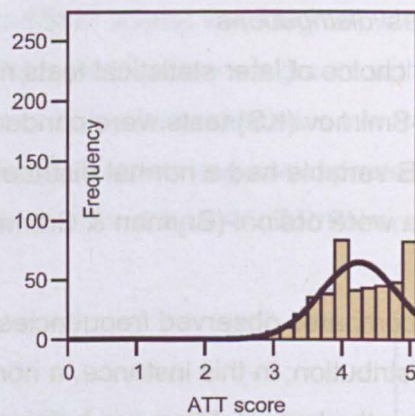


Figure 5.3b ATT distribution

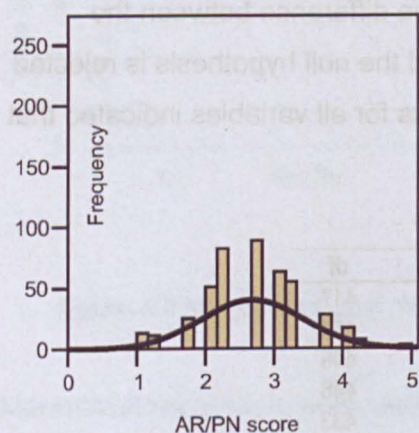


Figure 5.3c AR/PN distribution

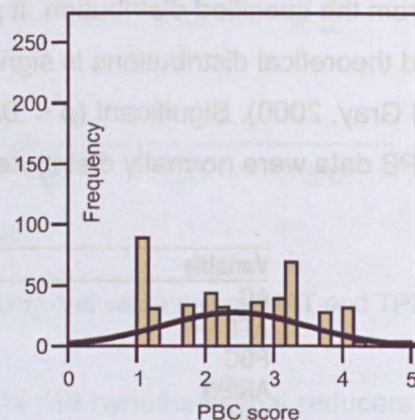


Figure 5.3d PBC distribution

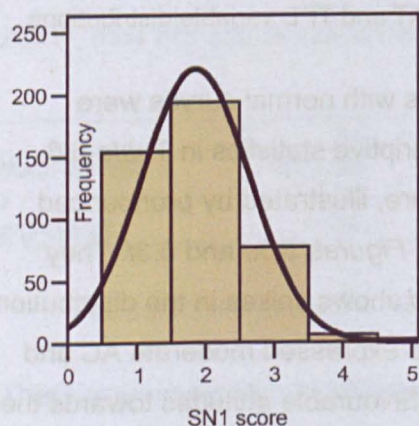


Figure 5.3e SN1 distribution

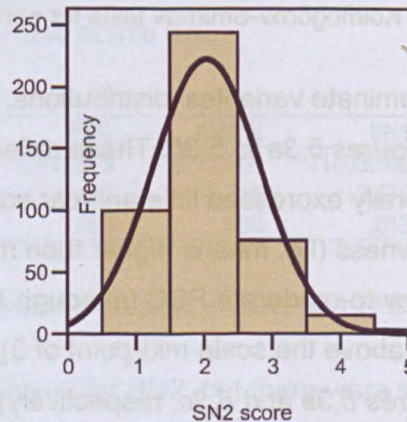


Figure 5.3f SN2 distribution

The non-normal distributions had implications for the methods used to measure inter-variable correlations and to test the study's hypotheses. In the latter regard, since the outcome variable was dichotomous (intend to reduce/maintain car use), logistic regression was appropriate. In logistic regression,  $\hat{Y}_i$  is the probability of a case having one of the two outcomes "based on a non-linear function of the best linear combination of predictors" (Zaman Bin Ahmad, 2003, 153). This is represented by

$$\hat{Y}_i = e^u / 1 + e^u$$

where  $\hat{Y}_i$  is the estimated probability that the  $i^{th}$  case is in one of the outcome categories and  $u$  is the linear regression represented by

$$u = a + b_1x_1 + b_2x_2 + \dots + b_kx_k$$

with constant  $a$ , coefficients  $b_j$  and predictors  $x_j$  for  $k$  predictors ( $j = 1, 2, \dots, k$ ). The main difference between linear and logistic regression is that in the former, the linear part of the equation is an end in itself, while in the latter it is a means of calculating the odds of a case being in one of the outcome categories (Tabachnick and Fidell, 2001).

Although it has been stated that "in logistic regression, the predictors do not have to be normally distributed" (Ibid., 517), this fails to account for the fact that some software packages, including SPSS, use the maximum likelihood (ML) method in logistic regression. ML fits a multivariate normal distribution to estimate parameter values resulting in the highest likelihood of observing the actual data. If applied when predictors are non-normal (as here), it can lead to inflated standard errors (SE). It may also bias regression coefficients so that they would differ if the model was applied to another sample from the population (Gujarati, 1995). Although SPSS offers no way around this, EViews – an econometrics package – provides two solutions (QMS, 1999); the Quasi-maximum likelihood (QML) and generalised linear model (GLM) regression techniques. GLM was chosen because as well as being robust to non-normal data, it is robust to heteroscedasticity in regressions (whereby residuals are not randomly dispersed across all values of predictors). Diagnostic testing revealed some heteroscedasticity, supporting the choice of GLM (see section 5.6).



#### 5.4.2.5 Scale correlations

Although inter-item correlations were calculated as part of the PCA (see section 5.4.1.2), relationships between scales constructed from items were also assessed to check for multicollinearity of variables to be used as regression predictors. As noted in section 5.4.2.3, scale data were discrete. Therefore, Spearman's rho ( $\rho$ ) correlation coefficients were calculated for each pair of predictors.

For the Spearman test, data are converted to rank order so that the smallest value of each of the two variables whose association is being examined is ranked 1, the next smallest 2, and so on. This gives a series of pairs. To test the null hypothesis that  $\rho = 0$ , the following equation is used

$$r_s = 1 - 6 \sum d^2 / n(n^2 - 1)$$

where  $r_s$  is the test statistic,  $n$  is the number of pairs and  $d$  is the difference in rank between each pair (Tabachnick & Fidell, 2001). If  $r_s$  is significant ( $p < .05$ ) the variables are correlated and the null hypothesis can be rejected. Correlations between scales are shown in *Table 5.10*. The highest was  $\rho = .690$  ( $p < .001$ ), between AR/PN and AC. This suggested that multicollinearity would not be a problem, as only significant values  $\geq .80$  are said to be cause for concern over non-independence of variables (Field, 2000).

		AC	ATT	PBC	NEP	AR/PN	SN1
ATT	$\rho$	-.239					
	$p$ (2-tailed)	< .001					
	$n$	417					
PBC	$\rho$	.267	-.168				
	$p$ (2-tailed)	< .001	< .001				
	$n$	409	446				
NEP	$\rho$	.659	-.196	.254			
	$p$ (2-tailed)	< .001	< .001	< .001			
	$n$	382	402	394			
AR/PN	$\rho$	.690	-.249	.242	.466		
	$p$ (2-tailed)	< .001	< .001	< .001	< .001		
	$n$	408	446	436	399		
SN1	$\rho$	.381	-.256	.246	.259	.502	
	$p$ (2-tailed)	< .001	< .001	< .001	< .001	< .001	
	$n$	399	433	422	386	424	
SN2	$\rho$	-.009	-.123	.041	-.078	.148	.256
	$p$ (2-tailed)	.851	.010	.398	.125	.002	< .001
	$n$	402	439	429	387	428	425

*Table 5.10* Inter-correlations among NAT and TPB variables

It is especially notable that AR/PN was only moderately correlated with SN1 ( $\rho = .502$ ,  $p < .001$ ) and weakly correlated with SN2 ( $\rho = .148$ ,  $p = .002$ ). It has been suggested that using PN and SN as separate predictors in regressions might assume that they are independent when they are not (Steg, 2004). Certainly Schwartz (1977) argues that PN may incorporate SN and there is evidence from ESB studies that these constructs overlap (e.g. Harland *et. al.*, 1999). The picture in this study was confused slightly by treatment of AR/PN as a single variable. The fact that feelings of responsibility (AR) were tied up with normative self-expectations (PN) may have weakened the combined variable's association with SN. Nonetheless, the relatively modest correlations showed sufficient independence for the variables to be used as separate regression predictors.

## 5.5 Results

Results for each hypothesis listed in section 5.2.3 are presented in sections 5.5.1 to 5.5.4. A comparison of results for each regression model is provided in section 5.5.5.

### 5.5.1 *Hypothesis 1: Congruent with NAT, variance in drivers' car use intentions will be explained by AC, AR and PN*

As AR and PN were not differentiated by the PCA, this hypothesis could not be tested exactly as formulated. Using EViews, a logistic regression was performed with car use intention (BI) as the outcome variable and AC and AR/PN as predictors. Although 408 drivers had scores on both predictors, only 312 were included. Direct comparison of regression models testing each hypothesis required that the same participants were used in each analysis. Only 312 drivers provided sufficient data to be included in tests of all hypotheses (due to lower response rates for some contextual variables). The forced entry regression method was used, as the analysis tested an established theory (Bryman & Cramer, 2001; Field, 2000). That is, predictors were entered based on theoretical grounds, not statistical significance. *Table 5.11* shows EViews' output for the regression testing hypothesis 1.

McFadden  $R^2$  is analogous with  $R^2$  in linear regression, taking a value between 0 and 1 and, when multiplied by 100, indicating the percentage of variance in the outcome variable attributable to the predictors. Adjusted  $R^2$  applies a penalty to  $R^2$ , reducing it as the number of predictors rises (since adding another predictor would otherwise always increase  $R^2$ ). EViews does not produce adjusted  $R^2$  for logistic regression.

Predictor	coefficient	SE	z	p
AR/PN	2.275	0.296	8.944	< 0.001
AC	0.687	0.342	4.562	0.034
constant	-10.456	1.291	-7.945	< 0.001
Mean dependent var	0.127	SD dependent var		0.333
SE of regression	0.265	Akaike info criterion		0.521
Sum squared resid	28.194	Schwarz info criterion		0.526
Log likelihood	-78.339	Hannan-Quinn criterion		0.509
Restr. log likelihood	-141.912	Avg. log likelihood		-0.214
LR statistic (2 df)	96.273	McFadden R <sup>2</sup>		0.341
Probability(LR stat)	< 0.001	Adjusted R <sup>2</sup>		0.327
Dep=0 (maintainers)	270	Total n		312
Dep=1 (reducers)	42			

*Table 5.11 Regression of BI on NAT variables*

Field (2000, citing Stevens, 1992), however, provides Stein's formula for adjusted  $R^2$ .

$$\text{adjusted } R^2 = 1 - (n - 1 / n - k - 1)(n - 2 / n - k - 2)(n + 1 / n)(1 - R^2)$$

where  $n$  is number of cases and  $k$  is number of predictors in the model.

This formula was used here because the number of predictors (including constants) in regressions used to test the four hypotheses ranged from three (hypothesis 1) to 10 (hypothesis 4), so  $R^2$  may have been artificially inflated in the larger models. Adjusted  $R^2$ , on the other hand, provides a consistent basis for model comparison. Applying the equation to this regression gave

$$\begin{aligned} \text{adjusted } R^2 &= 1 - (311 / 308)(310 / 307)(313 / 312)(1 - .341) \\ &= 1 - (1.009)(1.009)(1.003)(.659) \\ &= 1 - .673 \\ &= .327 \end{aligned}$$

Adjusted  $R^2$  was calculated in this way for each regression reported below.

*Table 5.11* shows that both AR/PN and AC were significantly, positively associated with intention to reduce car use. AR/PN's higher regression coefficient indicates that its influence was stronger than AC's. It was also more statistically significant ( $p < .001$ , as opposed to AC's  $p = .034$ ). (Although unstandardised regression coefficients are reported, the effects of different psychological variables are directly comparable because each was measured on the same 1 to 5 scale.) The SEs of regression

coefficients indicate the likelihood of the null hypothesis (that the coefficient = 0; i.e. no relationship between predictor and outcome) being true for the population. Since the regression fits a normal distribution to the data to estimate model parameters, the properties of this distribution can be used to infer the probability of the regression coefficient for the population falling within the bounds set by the SE values. Take, for example, AC's coefficient of .687 ( $p = .034$ ) and SE of .342. One can interpret the range within one SE of the coefficient (.345 to 1.029) as an approximate 68% confidence interval for the population coefficient. That is, one would expect the coefficients of 68% of samples from the population to fall within this range. Similarly, the range within two SEs (.003 to 1.371) represents a 95% confidence interval. Given that 95% confidence is often applied as the criterion for statistical significance in social science research (e.g. Bryman & Cramer, 2001), the question was whether 0 lay within the 95% confidence interval. In this instance, it did not (although it was only just outside), so the coefficient is statistically significant at .05 level. The smaller the SE, the further outside the 95% confidence interval 0 will fall and the less likely it is that the population coefficient is actually 0.

Measures of overall model fit are provided by the information criteria statistics. These are useful for selecting the best model – in terms of balance between parsimony and goodness-of-fit – from a range of alternatives (Enders, 2004). Of the three information criteria provided by EViews, the Schwarz criterion (SIC) and the Akaike criterion (AIC) are the most commonly used. The smaller their values, the better the model. The equations are

$$AIC = t \ln(\text{sum of squared residuals}) + 2n$$

$$SIC = t \ln(\text{sum of squared residuals}) + n \ln(t)$$

where  $n$  is the number of predictors (including the constant),  $t$  is the number of cases and  $t \ln$  is its natural logarithm. The SIC is more reliable for large samples and the AIC for small samples, but since 'large' and 'small' are undefined, "You can be quite confident of your results if both the AIC and the SIC select the same model" (Ibid., 70).

It is useful to compare the four models used to test the four hypotheses in this study and the SIC and AIC (alongside adjusted  $R^2$ ) facilitate this. The SIC for the NAT regression model = .526 and the AIC = .521.

The model correctly identified the intentions of 84.5% of participants, but only 38.9% of reducers (and 91.1% of maintainers). This, however, improved on the model including only the constant, which correctly classified just 12.7% of reducers, so hypothesis 1 was not rejected.

#### 5.5.2 Hypothesis 2: Congruent with the TPB, variance in drivers' car use intentions will be explained by ATT, PBC and SN

A logistic regression with forced entry was performed with BI as the outcome variable and ATT, PBC, SN1 and SN2 as predictors ( $n = 312$ ). Results are in Table 5.12.

ATT, PBC and SN1 ("friends") significantly ( $p < .05$ ) predicted BI, but SN2 ("people I know") was non-significant. ATT's negative coefficient shows that positive evaluations of one's own car use were associated with lower odds of expressing intentions to reduce it. Of the three significant predictors, PBC had the strongest influence on BI (coefficient = 1.518,  $p < .001$ ). McFadden  $R^2$  for the TPB model (.259) was lower than for the model based on NAT constructs, so the TPB explained less variance in BI than the NAT constructs. Adjusted  $R^2$  (.233) was lower still.

Predictor	coefficient	SE	z	P
ATT	-0.620	0.229	-4.546	0.017
PBC	1.518	0.213	7.295	< 0.001
SN1	0.689	0.190	3.020	< 0.001
SN2	0.158	0.329	1.822	0.185
constant	-6.738	1.302	-4.914	< 0.001
Mean dependent var	0.127	SD dependent var		0.334
SE of regression	0.256	Akaike info criterion		0.551
Sum squared resid	28.498	Schwarz criterion		0.559
Log likelihood	-80.898	Hannan-Quinn criterion		0.531
Restr. log likelihood	-131.982	Avg. log likelihood		-0.299
LR statistic (4 df)	68.193	McFadden $R^2$		0.259
Probability(LR stat)	< 0.001	Adjusted $R^2$		0.233
Dep=0 (maintainers)	270	Total n		312
Dep=1 (reducers)	42			

Table 5.12 Regression of BI on TPB variables

AIC for this model = .551, while SIC = .559. The TPB model achieved a poorer balance between parsimony and goodness-of-fit than the NAT model on both measures. In the TPB regression 30.2% of reducers were classified correctly, along with 91.1% of maintainers, giving 84.3% accuracy overall. These figures are to be contrasted with 11.3%, 88.7% and 79.8% respectively for the model including only the constant. Prediction of BI by the TPB was, therefore, less accurate than by the NAT constructs,

although the TPB offered more accurate prediction than the constant-only model in this regression.

**5.5.3 Hypothesis 3: A model comprising constructs from NAT and the TPB will explain more variance in drivers' car use intentions than either individual model**

A stepwise logistic regression was performed with BI as the outcome ( $n = 312$ ). All NAT and TPB variables were entered. On each step the predictor with the highest  $p$  value was removed until all predictors had  $p < .05$ . Results are in *Table 5.13*. Only AR/PN and PBC remained in the model at the fifth and final step. AR/PN had the higher regression coefficient (2.320,  $p < .001$ ).

Step	Predictor	coefficient	SE	z	p
1	AC	0.236	0.416	5.768	< 0.001
	AR/PN	2.401	0.398	0.590	0.555
	ATT	-0.134	0.300	-0.446	0.655
	PBC	0.828	0.198	4.171	< 0.001
	SN1	-.236	0.255	-0.924	0.355
	SN2	-.114	0.229	-0.496	0.619
	constant	-11.393	2.087	-5.458	< 0.001
2	AC	0.211	0.397	0.529	0.596
	AR/PN	2.432	0.415	5.855	< 0.001
	PBC	0.843	0.198	4.257	< 0.001
	SN1	-0.218	0.254	-0.860	0.389
	SN2	-0.122	0.231	-0.530	0.595
	constant	-12.007	1.605	-7.477	< 0.001
3	AR/PN	2.408	0.322	7.477	< 0.001
	PBC	0.845	0.180	4.681	< 0.001
	SN1	-0.185	0.236	-0.782	0.433
	SN2	-0.070	0.213	-0.330	0.741
	constant	-11.299	1.236	-9.139	< 0.001
4	AR/PN	2.428	0.319	7.591	< 0.001
	PBC	0.864	0.180	4.782	< 0.001
	SN1	-0.217	0.225	-0.963	0.336
	constant	-11.466	1.196	-9.583	< 0.001
5	AR/PN	2.316	0.270	9.588	< 0.001
	PBC	0.896	0.174	5.168	< 0.001
	constant	-11.963	1.1401	-11.085	< 0.001
Mean dependent var		0.127	SD dependent var		0.334
SE of regression		0.262	Akaike info criterion		0.498
Sum squared resid		30.125	Schwarz criterion		0.503
Log likelihood		-74.738	Hannan-Quinn criterion		0.487
Restr. log likelihood		-151.636	Avg. log likelihood		-0.224
LR statistic (4 df)		111.851	McFadden $R^2$		0.377
Probability(LR stat)		< 0.001	Adjusted $R^2$		0.366
Dep=0 (maintainers)		270	Total n		312
Dep=1 (reducers)		42			

*Table 5.13 Regression of BI on NAT and TPB variables*

For the final model, AIC = .498 and SIC = .503. Adjusted  $R^2$  (.366) was higher than for either previous model.  $R^2$  (.377) was also higher, indicating that this model explained more variance in BI than either theory's constructs alone. AR/PN's regression coefficient (2.136,  $p < .001$ ) was higher than in the NAT regression and PBC's coefficient (.896,  $p < .001$ ) was lower than in the TPB regression. This shows that when these two predictors were included in the same model rather than in their original theories, AR/PN's influence on BI increased whilst PBC's influence decreased.

In this regression, 42.1% of reducers were classified correctly, along with 91.4% of maintainers, providing 85.1% correct overall. The constant-only model correctly classified 12.9%, 87.1% and 77.5%, respectively. The model including variables from both NAT and the TPB gave more accurate classification of participants and explained more variance in BI than either individual model. Alongside its lower SIC and AIC values and its higher  $R^2$ , this shows that the model using constructs from both theories was the best of the three psychological models, so hypothesis 3 was not rejected.

#### 5.5.3.1 *An additional question: does PBC moderate the AR/PN-BI relationship?*

The finding that AR/PN and PBC were significant predictors of BI after the final step suggested another hypothesis. Might PBC moderate the AR/PN-BI relationship, as well as exerting a main effect on BI? As noted in Chapter 4, section 4.4, a moderator "affects the zero-order correlation between two other variables" (Baron & Kenny, 1986, 1174). Thus, even somebody who feels responsible for problems caused by their driving and obliged to reduce it may not intend to do so if they feel that reduction is beyond their control. PBC may "specify the appropriate conditions" (Ibid.) for AR/PN's influence on BI. The hypothesis was that *the AR/PN-BI relationship will be stronger for drivers expressing high PBC than for those expressing low PBC*.

Testing this required examination of the AR/PN-BI association. As BI was a dichotomous, categorical variable, this required contingency tables in which each cell must meet an expected count in order for tests to be reliable. No count should be  $< 1$  and no more than 20% should be  $< 5$  (Kinnear & Gray, 2000). When a table was produced with two rows representing the categories of BI (maintain or reduce car use) and multiple columns representing AR/PN scores, many cells did not meet expected counts. AR/PN was, therefore, collapsed into two categories, so that a 2x2 table could be produced with high counts in all cells.

The 312 drivers were divided into two groups around the median score on AR/PN (2.67). Those with scores  $\leq 2.67$  were assigned to the low AR/PN group ( $n = 192$ ) and those with scores  $> 2.67$  to the high AR/PN group ( $n = 120$ ). Group sizes were unequal because many participants had scores of exactly 2.67. (Including these people in the low AR/PN group meant that group sizes were closer to being equal than if they had been put in the high AR/PN group.) Next, the contingency table was constructed, with AR/PN group in the columns and BI in the rows (*Table 5.14*). Of those in the low AR/PN group, 92.2% expressed intentions to maintain car use, while 7.8% expressed intentions to reduce it. In the high AR/PN group, 77.5% expressed intentions to maintain car use and 22.5% expressed intentions to reduce it. Thus, there was a difference of 14.7% between those with high AR/PN and those with low AR/PN in terms of which intention they stated ( $22.5 - 7.8 = 14.7$ ).

		AR/PN group	
		Low	High
Intention (BI)	Maintain car use	$n$ 177	93
		% 92.2	77.5
	Reduce car use	$n$ 15	27
		% 7.8	22.5
Total		$n$ 192	120
Difference in % across AR/PN levels		14.7	

*Table 5.14* Contingency table showing BI by AR/PN group

To calculate the strength of the AR/PN-BI relationship, the phi ( $\Phi$ ) coefficient was computed. Like Pearson's and Spearman's coefficients,  $\Phi$  takes a value between -1 and 1, with 0 indicating no relationship and -1 or 1 indicating a perfect (negative or positive) relationship.  $\Phi$  is a derivative of  $\chi^2$  and is expressed by

$$\Phi = \sqrt{\chi^2 / n}$$

where  $n$  is the total number of cases in the analysis.  $\Phi$  was used because both variables were dichotomous (Bryman & Cramer, 2001; Kinnear & Gray, 2000). For the AR/PN-BI association across all 312 drivers,  $\Phi = .22$  ( $p < .001$ ).

The next step was to divide drivers around the median PBC score (2.33). Those with scores  $\leq 2.33$  were assigned to the low PBC group ( $n = 144$ ) and everyone else to the



high PBC group ( $n = 168$ ). Contingency tables of BI by AR/PN group were then constructed for each PBC level (*Table 5.15*).

		Low PBC			High PBC	
		AR/PN group			AR/PN group	
		Low	High	Low	High	
Intention (BI)	Maintain car use	<i>n</i>	93	37	84	56
		%	93.0	84.1	91.3	73.7
	Reduce car use	<i>n</i>	7	7	8	20
		%	7.0	15.9	8.7	26.3
	Total	<i>n</i>	100	44	92	76
Difference in % across AR/PN levels			8.9		17.6	

*Table 5.15* Contingency tables showing BI by AR/PN group for low and high PBC groups

At low PBC levels, 93.0% of those with low AR/PN expressed intentions to maintain car use, while 7.0% expressed intentions to reduce it. Of those with high AR/PN, 84.1% expressed intentions to maintain car use and 15.9% expressed intentions to reduce it. The difference in BI between low and high AR/PN groups was, therefore, 8.9%; smaller than in *Table 5.14*. At high PBC levels, 91.3% of those with low AR/PN expressed intentions to maintain car use, while 8.7% expressed intentions to reduce it. In the high AR/PN group, 73.7% expressed intentions to maintain car use and 26.3% expressed intentions to reduce it. Here, there was a 17.6% difference in BI between the low and high AR/PN groups; greater than in *Table 5.14*. AR/PN-BI correlation for the low PBC group was  $\Phi = .16$  ( $p = .020$ ), while for those with high PBC it was  $\Phi = .24$  ( $p < .001$ ). Thus, as hypothesised, AR/PN-BI relationship was stronger for drivers expressing high PBC than for those expressing low PBC; a partial moderating effect.

Baron & Kenny (1986, 1175) note that their suggested correlational method of testing for moderation “presumes that the independent variable has equal variance at each level of the moderator”. This meant that variance in AR/PN should be equal in the low and high PBC groups. Variance was .55 in the low PBC group and .52 in the high PBC group. These values were assumed to be close enough to avoid the problem that if

variances differ across levels of the moderator, then for levels of the moderator with less variance, the correlation of the independent variable with the dependent variable tends to be less than for levels of the moderator with more variance

(*Ibid.*).

In fact, there was less variance in AR/PN among the high PBC group, yet AR/PN-BI correlation was stronger for this group. Given that lower variance tends to bias the correlation coefficient down rather than up, we can be confident that AR/PN-BI association was stronger for drivers with high PBC.

#### 5.5.4 *Hypothesis 4: Addition of contextual variables to a model comprising constructs from NAT and the TPB will explain more variance in drivers' car use intentions than psychological variables alone*

When assessing the influence of contextual and psychological variables, environmental psychology studies sometimes enter regression predictors in two blocks; contextual variables first and psychological variables second (e.g. Olli *et. al.*, 2001). The rationale is that this clearly shows each type of variable's contribution to explained variance in the outcome. This method is not always used, however (e.g. Gatersleben *et. al.*, 2002). Stern, Dietz and Kalof (1993) suggest that all predictors should be entered simultaneously in exploratory models. This was done in the present analysis (as the model combined variables from two theories as well as adding contextual predictors).

A stepwise regression was performed, using the same removal criterion as in analysis for hypothesis 3 ( $n = 312$ ). AR/PN, AC, ATT, PBC, SN1 and SN2 were entered as psychological predictors, with BI as the outcome variable.

Eight physical-contextual and five socio-demographic predictors were also entered. Spearman's  $\rho$  correlations between all variables are shown in *Table 5.16*. These are based on the 312 drivers included in regressions, all of whom provided data on all variables. Correlations significant at .05 are marked \* and coefficients  $\geq .80$  are bold, as associations of this strength may indicate collinearity (Field, 2000). All correlations are shown for completeness, but two – between journey time from home to DMU and journey time from DMU to home ( $\rho = .810, p < .001$ ) and between perceived and actual journey distance ( $\rho = .922, p < .001$ ) – were  $\geq .80$ . On this basis, journey time from DMU to home and perceived journey distance were discarded. Perceived distance was not used as a regressor because it was considered better to have measures of actual context where possible. Journey time from DMU to home rather than from home to DMU was excluded simply because it came later in the questionnaire. There was no other basis on which to choose between them. *Table 5.17* shows regression results.

		AR/PN	AC	NEP	ATT	PBC	SN1	SN2	bicycle ownership	perceived access to bus service	perceived access to train service	perceived cost of car travel	journey time from home to DMU	journey time from DMU to home	perceived journey distance	carriage of others in car to DMU	combining DMU with other trips	actual journey distance	gender	age	job type	full- or part- time
AC	$\rho$	.690																				
	$p$	.000*																				
NEP	$\rho$	.466	.659																			
	$p$	.000*	.000*																			
ATT	$\rho$	-.249	-.239	-.196																		
	$p$	.000*	.000*	.000*																		
PBC	$\rho$	.242	.267	.254	-.168																	
	$p$	.000*	.000*	.000*	.000*																	
SN1	$\rho$	.502	.381	.259	-.256	.246																
	$p$	.000*	.000*	.000*	.000*	.000*																
SN2	$\rho$	.148	-.009	-.078	-.123	.041	.256															
	$p$	.002*	.851	.125	.010*	.398	.000*															
bicycle ownership	$\rho$	.126	.114	.080	-.038	-.071	-.053	.015														
	$p$	.008*	.021*	.111	.417	.134	.271	.753														
perceived access to bus service	$\rho$	.123	.173	.151	-.031	.425	.132	.020	-.100													
	$p$	.010*	.000*	.002*	.517	.000*	.006*	.675	.034*													
perceived access to train service	$\rho$	.122	.152	.021	-.067	.167	.016	.015	.034	.189												
	$p$	.010*	.002*	.676	.152	.000*	.747	.751	.478	.000*												
perceived cost of car travel	$\rho$	-.048	-.087	-.081	.191	.174	-.060	-.077	-.007	.134	-.057											
	$p$	.315	.079	.105	.000*	.000*	.213	.111	.884	.005*	.232											
journey time from home to DMU	$\rho$	-.075	-.011	-.084	-.140	-.262	-.091	-.078	.050	-.246	.145	-.294										
	$p$	.129	.831	.108	.004*	.000*	.070	.116	.309	.000*	.003*	.000*										
journey time from DMU to home	$\rho$	-.141	-.037	-.038	-.177	-.260	-.126	-.060	.087	-.189	.217	-.306	.810									
	$p$	.019*	.550	.553	.003*	.000*	.039*	.324	.146	.001*	.000*	.000*	.000*									
perceived journey distance	$\rho$	-.063	-.019	-.065	-.104	-.374	-.120	-.067	.114	-.345	.249	-.302	.727	.754								
	$p$	.188	.697	.197	.027*	.000*	.013*	.164	.016*	.000*	.000*	.000*	.000*	.000*								
carriage of others in car to DMU	$\rho$	.080	.131	.163	-.006	.133	-.016	-.013	-.056	.167	.016	.054	-.126	-.056	-.173							
	$p$	.091	.008*	.001*	.907	.005*	.736	.788	.234	.000*	.734	.249	.010*	.347	.000*							
combining DMU with other trips	$\rho$	.059	.023	.094	.052	-.011	.037	-.002	-.047	.103	.049	.080	-.012	.004	-.074	.199						
	$p$	.221	.648	.063	.269	.818	.449	.967	.324	.029*	.302	.091	.813	.952	.119	.000*						
actual journey distance	$\rho$	-.075	-.022	-.060	-.140	-.386	-.123	-.033	.105	-.332	.220	-.281	.695	.718	.922	-.203	-.078					
	$p$	.150	.680	.281	.006*	.000*	.020*	.528	.044*	.000*	.000*	.000*	.000*	.000*	.000*	.000*	.135					

Table 5.16 Correlations between psychological and contextual variables for drivers included in regressions (continues)

		AR/PN	AC	NEP	ATT	PBC	SN1	SN2	bicycle ownership	perceived access to bus service	perceived access to train service	perceived cost of car travel	journey time from home to DMU	journey time from DMU to home	perceived journey distance	carriage of others in car to DMU	combining DMU with other trips	actual journey distance	gender	age	job type	full- or part- time
gender	$\rho$	.029	-.067	-.029	-.011	.035	.045	-.020	.029	-.082	-.035	-.101	.028	-.017	.095	-.081	-.159	.091				
	$p$	.547	.181	.576	.826	.473	.359	.679	.544	.087	.470	.036*	.579	.785	.048*	.091	.001*	.080				
age	$\rho$	.011	-.015	-.007	.101	-.096	.031	.008	.006	-.058	-.097	-.001	-.068	-.043	-.010	-.108	-.054	-.019	.252			
	$p$	.825	.760	.893	.034*	.047*	.533	.867	.894	.223	.042*	.978	.170	.476	.829	.023*	.258	.711	.000*			
job type	$\rho$	-.151	-.074	-.002	-.057	.020	-.033	-.047	-.017	.084	-.046	-.001	-.093	-.097	-.103	.044	-.030	-.094	-.204	-.320		
	$p$	.002*	.135	.976	.228	.674	.499	.334	.728	.077	.336	.982	.060	.105	.031*	.353	.532	.069	.000*	.000*		
full- or part-time	$\rho$	.079	.126	.080	-.069	-.029	.060	.054	.108	-.025	-.061	-.046	-.051	-.068	-.033	-.015	.136	-.010	-.162	.128	.020	
	$p$	.102	.011*	.118	.151	.554	.223	.266	.024*	.607	.204	.336	.306	.264	.493	.758	.005*	.841	.001*	.008*	.670	
income	$\rho$	.060	.009	-.051	.076	.020	.025	-.029	-.033	-.059	.025	.078	.056	.018	.090	-.085	-.092	.080	.372	.355	-.636	-.410
	$p$	.225	.864	.333	.123	.693	.621	.564	.501	.230	.617	.113	.278	.769	.067	.083	.061	.126	.000*	.000*	.000*	.000*

Table 5.16 (continued) Correlations between psychological and contextual variables for drivers included in regressions

Step	Predictor	coefficient	SE	z	p
1	AC	0.535	0.678	0.789	0.430
	AR/PN	4.079	0.878	4.645	< 0.001
	ATT	-0.353	0.530	-0.667	0.505
	PBC	1.008	0.316	3.190	0.001
	SN1	0.454	0.444	1.021	0.308
	SN2	0.582	0.362	1.608	0.108
	actual journey distance	0.032	0.414	0.079	0.037
	bicycle ownership	1.295	0.640	2.021	0.043
	carriage of others in car to DMU	-1.046	0.542	-1.927	0.054
	combining DMU with other trips	-0.956	0.653	-1.464	0.143
	journey time from home to DMU	-0.782	0.489	-1.596	0.110
	perceived access to bus service	1.025	0.873	1.174	0.240
	perceived access to train service	0.926	0.629	1.472	0.141
	perceived cost of car travel	0.944	0.313	3.015	0.003
	age	-0.908	0.330	-2.746	0.006
	full- or part-time	1.235	0.747	1.652	0.098
	gender	-0.402	0.769	-0.524	0.601
	income	-1.034	0.555	-1.862	0.063
	job	-0.824	0.474	-1.740	0.082
	constant	-5.409	4.394	-1.231	0.218
2	AC	0.481	0.432	1.114	0.265
	AR/PN	4.033	0.561	7.180	0.000
	ATT	-0.342	0.340	-1.005	0.315
	PBC	0.978	0.198	4.930	< 0.001
	SN1	0.469	0.285	1.642	0.101
	SN2	0.598	0.233	2.558	0.011
	actual journey distance	0.085	0.258	0.331	0.140
	bicycle ownership	1.299	0.411	3.158	0.002
	carriage of others in car to DMU	-1.072	0.351	-3.048	0.002
	combining DMU with other trips	-0.954	0.421	-2.264	0.024
	journey time from home to DMU	-0.722	0.305	-2.360	0.018
	perceived access to bus service	0.978	0.553	1.767	0.077
	perceived access to train service	0.918	0.404	2.272	0.023
	perceived cost of car travel	0.961	0.200	4.804	< 0.001
	age	-0.941	0.210	-4.476	< 0.001
	full- or part-time	1.228	0.478	2.565	0.010
	income	-1.100	0.343	-3.208	0.001
	job	-0.845	0.299	-2.824	0.005
	constant	-5.637	2.800	-2.013	0.044
3	AC	0.474	0.434	1.093	0.275
	AR/PN	4.020	0.560	7.168	< 0.001
	PBC	0.986	0.196	5.011	< 0.001
	SN1	0.461	0.286	1.610	0.107
	SN2	0.591	0.233	2.536	0.011
	actual journey distance	0.074	0.231	0.402	0.009
	bicycle ownership	1.283	0.408	3.142	0.002
	carriage of others in car to DMU	-1.061	0.354	-2.999	0.003
	combining DMU with other trips	-0.943	0.420	-2.244	0.025
	journey time from home to DMU	-0.799	0.200	-3.992	< 0.001
	perceived access to bus service	0.971	0.198	4.896	0.351
	perceived access to train service	0.874	0.381	2.291	0.022
	perceived cost of car travel	0.934	0.536	1.741	0.082
	age	-0.940	0.210	-4.476	< 0.001
	full- or part-time	1.235	0.478	2.583	0.010
	income	-1.089	0.340	-3.202	0.001

Table 5.17 Regression of BI on psychological and contextual variables (continues)

Step	Predictor	coefficient	SE	z	p
3 (cont.)	job	-0.834	0.297	-2.809	0.005
	constant	-5.844	2.727	-2.142	0.032
4	AC	0.487	0.434	1.123	0.262
	AR/PN	3.994	0.553	7.212	< 0.001
	PBC	1.008	0.193	5.203	< 0.001
	SN1	0.398	0.274	1.450	0.147
	SN2	0.610	0.232	2.631	0.009
	actual journey distance	0.916	0.530	1.728	0.084
	bicycle ownership	1.332	0.401	3.320	0.001
	carriage of others in car to DMU	-1.033	0.336	-3.071	0.002
	combining DMU with other trips	-0.927	0.416	-2.227	0.026
	journey time from home to DMU	-0.759	0.192	-3.942	< 0.001
	perceived access to train service	0.891	0.375	2.375	0.018
	perceived cost of car travel	0.950	0.194	4.887	< 0.001
	age	-0.965	0.206	-4.668	< 0.001
	full- or part-time	1.245	0.472	2.638	0.008
	income	-1.065	0.334	-3.185	0.001
	job	-0.800	0.291	-2.743	0.006
	constant	-7.442	2.208	-3.369	0.001
5	AR/PN	3.103	0.450	6.890	< 0.001
	PBC	0.866	0.200	4.329	< 0.001
	SN1	0.176	0.281	0.627	0.530
	SN2	0.483	0.252	1.912	0.056
	actual journey distance	0.995	0.589	1.689	0.091
	bicycle ownership	1.668	0.439	3.793	< 0.001
	carriage of others in car to DMU	-0.872	0.344	-2.537	0.011
	combining DMU with other trips	-0.575	0.450	-1.277	0.202
	journey time from home to DMU	-0.764	0.218	-3.502	0.001
	perceived access to train service	0.855	0.410	2.085	0.037
	perceived cost of car travel	0.786	0.202	3.885	< 0.001
	age	-0.822	0.217	-3.772	< 0.001
	full- or part-time	0.871	0.518	1.681	0.093
	income	-0.942	0.340	-2.767	0.006
	job	-0.737	0.306	-2.404	0.016
	constant	-7.095	2.349	-3.020	0.003
6	AR/PN	3.057	0.571	5.355	< 0.001
	PBC	0.866	0.265	3.260	0.001
	SN2	0.510	0.324	1.572	0.116
	actual journey distance	1.003	0.787	1.274	0.103
	bicycle ownership	1.754	0.585	2.995	0.003
	carriage of others in car to DMU	-0.865	0.448	-1.930	0.054
	combining DMU with other trips	-0.542	0.594	-0.913	0.361
	journey time from home to DMU	-0.751	0.292	-2.566	0.010
	perceived access to train service	0.800	0.546	1.463	0.143
	perceived cost of car travel	0.795	0.269	2.949	0.003
	age	-0.826	0.289	-2.857	0.004
	full- or part-time	0.885	0.689	1.285	0.199
	income	-0.920	0.442	-2.078	0.038
	job	-0.682	0.395	-1.724	0.085
	constant	-7.589	3.103	-2.445	0.015
7	AR/PN	2.928	0.401	7.294	< 0.001
	PBC	0.890	0.198	4.479	< 0.001
	SN2	0.503	0.241	2.089	0.037
	actual journey distance	1.054	0.586	1.797	0.022

Table 5.17 (continued) Regression of BI on psychological and contextual variables (continues)

Step	Predictor	coefficient	SE	z	p
7 (cont.)	bicycle ownership	1.765	0.440	4.004	< 0.001
	carriage of others in car to DMU	-0.889	0.336	-2.643	0.008
	journey time from home to DMU	-0.734	0.215	-3.403	0.001
	perceived access to train service	0.714	0.402	1.777	0.076
	perceived cost of car travel	0.748	0.197	3.783	< 0.001
	age	-0.759	0.208	-3.643	< 0.001
	full- or part-time	0.833	0.516	1.614	0.007
	income	-0.852	0.324	-2.625	0.009
	job	-0.634	0.293	-2.166	0.030
	constant	-7.862	2.325	-3.381	0.001
8	AR/PN	2.815	0.378	7.442	< 0.001
	PBC	0.876	0.191	4.574	< 0.001
	SN2	-0.474	0.232	-2.044	0.066
	actual journey distance	1.109	0.564	1.965	0.049
	bicycle ownership	1.815	0.433	4.190	< 0.001
	carriage of others in car to DMU	-0.923	0.337	-2.739	0.006
	journey time from home to DMU	-0.695	0.208	-3.330	0.001
	perceived cost of car travel	0.742	0.192	3.850	< 0.001
	age	-0.641	0.188	-3.396	0.001
	full- or part-time	0.747	0.390	1.914	0.041
	income	-1.098	0.299	-3.667	< 0.001
	job	-0.820	0.270	-3.028	0.003
	constant	-5.996	1.965	-3.051	0.002
9	AR/PN	2.764	0.369	7.480	< 0.001
	PBC	0.874	0.186	4.690	< 0.001
	actual journey distance	0.881	0.538	1.638	0.002
	bicycle ownership	1.758	0.423	4.150	< 0.001
	carriage of others in car to DMU	-0.954	0.340	-2.799	0.005
	journey time from home to DMU	-0.608	0.203	-2.991	0.003
	perceived cost of car travel	0.734	0.189	3.870	< 0.001
	age	-0.662	0.186	-3.551	< 0.001
	full- or part-time	1.267	0.412	2.998	0.002
	income	-1.101	0.295	-3.727	< 0.001
	job	-0.900	0.266	-3.377	0.131
	constant	-5.667	1.940	-2.920	0.004
10	AR/PN	2.816	0.363	7.763	< 0.001
	PBC	0.881	0.183	4.816	< 0.001
	actual journey distance	0.540	0.251	2.155	0.031
	bicycle ownership	1.289	0.388	3.321	0.001
	carriage of others in car to DMU	-0.904	0.328	-2.756	0.006
	journey time from home to DMU	-1.056	0.328	-3.220	0.001
	perceived cost of car travel	0.879	0.193	4.560	< 0.001
	age	-0.637	0.181	-3.511	< 0.001
	full- or part-time	1.327	0.439	3.018	0.003
	income	-0.469	0.197	-2.383	0.017
	constant	-5.939	1.899	-3.127	0.002
	Mean dependent var	0.127	SD dependent var		0.334
	SE of regression	0.258	Akaike info criterion		0.461
	Sum squared resid	20.128	Schwarz criterion		0.478
	Log likelihood	-60.923	Hannan-Quinn criterion		0.419
	Restr. log likelihood	-123.260	Avg. log likelihood		-0.205
	LR statistic (4 df)	118.674	McFadden R <sup>2</sup>		0.481
	Probability(LR stat)	< 0.001	Adjusted R <sup>2</sup>		0.441
	Dep=0 (maintainers)	270	Total n		312
	Dep=1 (reducers)	42			

Table 5.17 (continued) Regression of BI on psychological and contextual variables

AR/PN and PBC were again the only significant psychological predictors after the final (10<sup>th</sup>) step. AR/PN had a stronger influence. Positive regression coefficients indicate that the odds of expressing intentions to reduce car use were higher for part-time than full-time members of DMU and for bicycle owners than non-owners. Negative coefficients indicate that the odds of expressing intentions to reduce car use decreased with increases in journey time, number of passengers, age, or income.

McFadden  $R^2 = .481$  and adjusted  $R^2 = .441$ , the highest of any model tested. The nine predictors that were removed (AC, ATT, SN1, SN2, perceived access to bus service, perceived access to train service, combining commuting with other trips, gender and job type) raised McFadden  $R^2$  by just .016 (i.e. McFadden  $R^2 = .497$  for step 1). SIC for this model = .478 and AIC = .461; both lower than for any previous model. This shows a superior balance between goodness-of-fit and parsimony when contextual variables were included, despite there being more predictors. This model correctly classified 59.6% of reducers and 96.3% of maintainers, giving 91.4% correct overall. The model including only the constant correctly classified 13.5%, 86.5% and 76.7%, respectively. Inclusion of contextual variables as predictors improved explained variance in BI, as well as accuracy of classification and model fit. Thus, hypothesis 4 was not rejected.

#### 5.5.4.1 Further additional questions: psychological-contextual interactions

As with hypothesis 3, results for hypothesis 4 suggested further analyses. Given that PBC partially moderated AR/PN's effect on BI, it was decided that interactions between physical-contextual variables and AR/PN should also be examined.

First, contingency tables suggested that bicycle ownership had a clearer moderating effect than PBC on AR/PN-BI association (*Table 5.18*).

		No bicycle			Bicycle	
		AR/PN group		AR/PN group		
		Low	High	Low	High	
Intention (BI)	Maintain car use	<i>n</i>	94	38	75	46
		%	86.2	80.9	90.4	63.0
	Reduce car use	<i>n</i>	15	9	8	27
		%	13.8	19.1	9.6	37.0
	Total	<i>n</i>	109	47	83	73
	Difference in % across AR/PN levels		5.3		27.4	

*Table 5.18* Contingency tables showing BI by AR/PN group for bicycle owners and non-owners



For those without a bicycle ( $n = 156$ ), AR/PN-BI correlation was non-significant at  $\Phi = .073$  ( $p = .281$ ). For those with a bicycle ( $n = 156$ ) it was  $\Phi = .324$  ( $p < .001$ ). Nineteen point one percent of those with high AR/PN but no bicycle expressed intentions to reduce their car use, while 37.0% of those with high AR/PN who owned a bicycle expressed this intention. There was greater variance in AR/PN among those who owned bicycles than those who did not (.67 as opposed to .42), but since AR/PN-BI correlation was stronger and more significant among those owning a bicycle, this would not have led to a spurious association. If anything, it would have reduced the strength of the AR/PN-BI relationship among bicycle owners.

Another contingency table analysis suggested a partial moderating effect of carriage of passengers to DMU on AR/PN-BI association (*Table 5.19*).

		No passengers			Passengers	
		AR/PN group			AR/PN group	
		Low	High		Low	High
Intention (BI)	Maintain car use	<i>n</i>	131	61	37	23
		%	86.8	67.0	91.2	79.3
	Reduce car use	<i>n</i>	20	30	4	6
		%	13.2	33.0	8.8	20.7
	Total	<i>n</i>	151	91	41	29
	Difference in % across AR/PN levels			19.8	11.9	

*Table 5.19* Contingency tables showing BI by AR/PN group for lone drivers and those with passengers

For lone drivers ( $n = 242$ ), AR/PN-BI correlation was  $\Phi = .240$  ( $p < .001$ ). For those with passengers ( $n = 70$ ) it was non-significant at  $\Phi = .180$  ( $p = .074$ ). Twenty point seven percent of those with high AR/PN and who carried passengers expressed intentions to reduce their car use, while 33.0% of those with high AR/PN who travelled alone expressed this intention. There was greater variance in AR/PN levels among those carrying no passengers than those carrying passengers (.57 and .47, respectively). Thus, the weaker AR/PN-BI correlation for the passengers group should be treated cautiously as it may rest, in part, on 'restriction in range' of AR/PN (Ibid.).

Thirdly, there was an interaction between perceived cost of driving to DMU and AR/PN. Perceived cost was an ordinal variable with three categories (*Inexpensive/Neither expensive nor inexpensive/Expensive*). Crosstabulation therefore used a 3x2

contingency table (*Table 5.20*), meaning that  $\Phi$  was an inappropriate measure of AR/PN-BI association. Kendall's tau-b ( $\tau$ ) statistic was used instead (Bryman & Cramer, 2001; Kinnear & Gray, 2000). Like  $\Phi$  and  $\rho$ ,  $\tau$  takes a value between -1 and 1, indicating both the strength and direction of a relationship. It is also similar to  $\Phi$  and  $\rho$  in that it measures agreement between membership of ordered categories, or ranks (e.g. different perceptions of the expense of driving and different levels of AR/PN). The basis of  $\tau$  is that "one set of ranks can be converted into another by a succession of reversals of pairs of ranks in one set: the fewer reversals are needed (in relation to the total number of possible reversals), the larger the value of tau" and thus the stronger the association between the variables in question (*Ibid.*, 288).

		Inexpensive			Neither		Expensive	
		AR/PN group			AR/PN group		AR/PN group	
		Low	High		Low	High	Low	High
Intention (BI)	Maintain car use	<i>n</i>	64	36	59	27	45	21
		%	91.4	80.0	83.1	64.3	88.2	63.6
	Reduce car use	<i>n</i>	6	9	12	15	6	12
		%	8.6	20.0	16.9	35.7	11.8	36.4
Total		<i>n</i>	70	45	71	42	51	33
Difference in % across AR/PN levels			11.4		18.8		24.6	

*Table 5.20* Contingency tables showing BI by AR/PN group for drivers stating different perceptions of the expense of commuting by car

For those who said driving was inexpensive ( $n = 115$ ), AR/PN-BI correlation was significant at  $\tau = .177$  ( $p = .035$ ). For those saying driving was neither expensive nor inexpensive ( $n = 113$ ), the correlation was  $\tau = .217$  ( $p = .008$ ). For those saying driving was expensive ( $n = 84$ ), the correlation was  $\tau = .308$  ( $p = .001$ ). AR/PN was, therefore, most strongly and significantly correlated with BI when driving was perceived as expensive; when (perceived) context should favour reduced car use. Variance in AR/PN was similar across the groups (.59, .58 and .57, respectively), suggesting that correlations were reliable. The largest difference in intentions between drivers with low and high AR/PN was observed among those who said that driving was expensive.

The effect of journey time from home to DMU on the AR/PN-BI relationship was also examined using 3x2 contingency tables, as journey time was collapsed into three ordinal categories (*0-20 minutes*, *21-40 minutes* and *> 40 minutes*) (*Table 5.21*). For those taking 0-20 minutes ( $n = 75$ ), AR/PN-BI correlation was non-significant at  $\tau =$

.130 ( $p = .203$ ). For those taking 21-40 minutes ( $n = 153$ ), the correlation was significant at  $r = .297$  ( $p < .001$ ). For those taking over 40 minutes ( $n = 84$ ), the correlation was marginally non-significant at  $r = .205$  ( $p = .054$ ). Variance in AR/PN was similar across the groups (.57, .56 and .60, respectively). Of those with high AR/PN who took 0-20 minutes, 34.5% expressed intentions to reduce their car use. Of those with high AR/PN who took 21-40 minutes, 30.2% expressed this intention. Of those taking over 40 minutes, 21.4% expressed it. AR/PN-BI association was strongest and most significant for the 21-40 minutes group and the difference between the stated intentions of those with low and high AR/PN was also largest for this group (21.3%).

		0-20 minutes			21-40 minutes		> 41 minutes	
		AR/PN group			AR/PN group		AR/PN group	
		Low	High		Low	High	Low	High
Intention (BI)	Maintain car use	<i>n</i>	35	19	82	44	52	22
		%	76.1	65.5	91.1	69.8	92.9	78.6
	Reduce car use	<i>n</i>	11	10	8	19	4	6
		%	23.9	34.5	8.9	30.2	7.1	21.4
Total		<i>n</i>	46	29	90	63	56	28
Difference in % across AR/PN levels			10.6		21.3		14.3	

Table 5.21 Contingency tables showing BI by AR/PN group for drivers stating different journey times for commuting

Finally, the interaction of actual journey distance and AR/PN was examined, using 4x2 contingency tables and the  $r$  statistic (Table 5.22). Distance was collapsed into four categories, 0-5 miles, 5.1-10 miles, 10.1-20 miles and > 20 miles.

		0-5 miles			5.1-10 miles		10.1-20 miles		> 20 miles	
		AR/PN group			AR/PN group		AR/PN group		AR/PN group	
		Low	High		Low	High	Low	High	Low	High
Intention (BI)	Maintain car use	<i>n</i>	44	27	50	25	43	15	31	16
		%	78.6	67.5	94.3	69.4	89.6	75.0	88.6	66.7
	Reduce car use	<i>n</i>	12	13	3	11	5	5	4	8
		%	21.4	32.5	5.7	30.6	10.4	25.0	11.4	33.3
Total		<i>n</i>	56	40	53	36	48	20	35	24
Difference in % across AR/PN levels			11.1		24.9		14.6		21.9	

Table 5.22 Contingency tables showing BI by AR/PN group for drivers commuting different distances

There was no clear pattern to results. AR/PN-BI correlation was significant for the 5.1-10 and > 20 mile groups ( $n = 89$ ,  $r = .324$ ,  $p < .001$  and  $n = 59$ ,  $r = .297$ ,  $p = .016$ , respectively), but not for the 0-5 or 10.1-20 mile groups ( $n = 96$ ,  $r = .123$ ,  $p = .160$  and  $n = 68$ ,  $r = .169$ ,  $p = .136$ , respectively). Of participants with high AR/PN, those in the 0-5 and > 20 mile groups were most likely to express intentions to reduce their car use (32.5% and 33.3%, respectively), while 30.6% of the 5.1-10 mile group and 25.0% of the 10.1-20 mile group expressed this intention.

To summarise these interactions, the AR/PN-BI relationship was partially moderated by bicycle ownership, carriage of passengers when commuting, perceived cost of driving to DMU and journey time from home to DMU. AR/PN had a greater influence on BI for participants who owned a bicycle, commuted alone, perceived driving to be expensive and whose journeys took a medium time (21-40 minutes) as opposed to a short (1-20 minutes) or long (> 40 minutes) time. However, there was no discernible effect of actual journey distance on AR/PN-BI association.

#### 5.5.5 Results summary

To aid comparison of the regression models, results are summarised in *Table 5.23*. For each model, McFadden  $R^2$ , adjusted  $R^2$ , AIC and SIC are shown, along with percentages of those expressing intentions to reduce and maintain their car use correctly classified and the overall percentage correct.

Regression model	McFadden $R^2$	Adjusted $R^2$	AIC	SIC	% reducers correct	% maintainers correct	% correct overall
NAT constructs	.341	.327	.521	.526	38.9	91.1	84.5
TPB	.259	.233	.551	.559	30.2	91.1	84.3
Constructs from NAT and the TPB	.377	.366	.498	.503	42.1	91.4	85.1
Constructs from NAT and the TPB plus context	.481	.441	.461	.478	59.6	96.3	91.4

*Table 5.23* Comparison of regression models

These figures show that the model including contextual variables was superior to the psychological-only models. It classified participants more accurately (overall and for each intention) and had a higher  $R^2$  (.481) and adjusted  $R^2$  (.441). Importantly, its SIC (.478) and AIC (.461) were considerably lower than any other model's. This shows that the high  $R^2$  was not simply due to having more predictors, as the information criteria

compensate for this. Comparison of the other regressions shows that the NAT-based model was superior to the TPB.

5.6 Regression diagnostics

Variable inter-correlations were examined before regressions (Tables 5.10 and 5.16) and two variables were excluded from analysis for hypothesis 4, as they were deemed too closely related (see section 5.5.4).

Heteroscedasticity in residuals was confirmed by plotting predictors against squared residuals. Plots for the NAT regression are shown in Figure 5.4. Residuals cluster at high values of AC and intermediate values of AR/PN. All four regression models produced some heteroscedasticity, although it was not as pronounced in any of the other three as in the NAT analysis. However, the GLM regression method was chosen because it is robust to heteroscedasticity, producing reliable parameter estimates even where this phenomenon occurs.

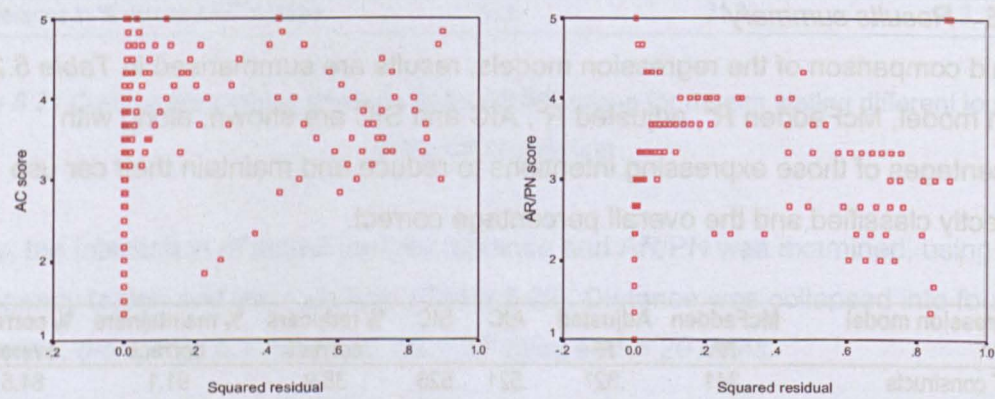


Figure 5.4 AC and AR/PN plotted against squared residuals

Examination of standardised residuals also showed that all four regressions produced non-normal residual distributions. To illustrate, Figure 5.5 shows a histogram of the distribution from the NAT regression, with accompanying statistics. This example is provided because, of the four models tested, the NAT regression had the standardised residual distribution furthest from normality. The Jarque-Bera statistic refers to a test for normality of distribution. Significant  $p$  values indicate non-normal distributions. Jarque-Bera statistics for all regressions were significant ( $p < .05$ ). Although the ML regression method assumes normally distributed residuals (Field, 2000), GLM was chosen specifically because of its robustness to this property, so parameter estimates were



reliable despite the residual distributions. (The Jarque-Bera test was used, as opposed to the KS test described in section 5.4.2.4, because standardised residuals were continuous rather than discrete; Bryman & Cramer, 2001).

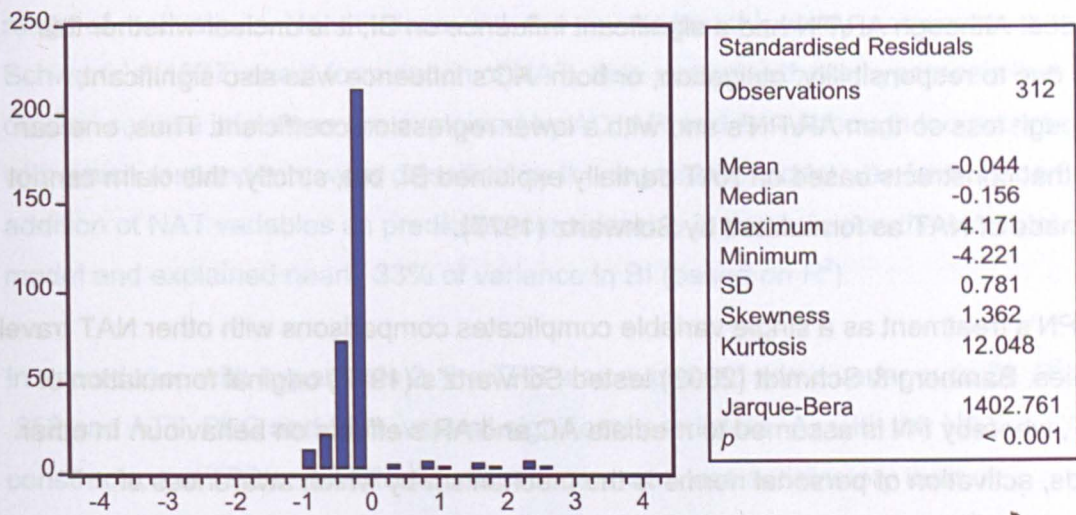


Figure 5.5 Distribution of NAT standardised regression residuals

## 5.7 Discussion

### 5.7.1 Four regression models to predict car use intentions

Using logistic regression, this study tested four models' ability to predict drivers' intentions to reduce or maintain their car use for commuting to DMU. Investigation of NAT was hampered by failure to derive separate AR and PN measures from survey items. Since items designed to tap these theoretically separate constructs (Schwartz, 1977) loaded highly on one factor, AR/PN was treated as a single latent variable. This is not unheard of in NAT research. Travel behaviour studies by Hunecke *et al.* (2001) and Matthies *et al.* (2002) both used combined responsibility/obligation variables (to explain self-reported subway use and willingness to reduce car use, respectively). Matthies *et al.* (2002) report no PCA or scale reliability statistics for their 'ecological norm' variable. Hunecke *et al.* (2001) called their variable PN, although the scale included AR items alongside obligation items. All items loaded on the same factor and the scale had  $\alpha = .83$ , suggesting that people may not easily distinguish between feelings of responsibility and obligation. This is not to say, however, that people never make this distinction. Other NAT studies empirically support AR and PN's separation (e.g. Stern *et al.*, 1999). It could also be that the close association between AR and PN

in the present study was due to PN being measured by a single item. With hindsight, it may have been better to tap this construct with multiple items.

Treatment of AR/PN as one variable made it impossible to test hypothesis 1 exactly as worded. Although AR/PN had a significant influence on BI, it is unclear whether this was due to responsibility, obligation, or both. AC's influence was also significant, although less so than AR/PN's and with a lower regression coefficient. Thus, one can say that constructs based on NAT partially explained BI, but, strictly, this claim cannot be made of NAT as formulated by Schwartz (1977).

AR/PN's treatment as a single variable complicates comparisons with other NAT travel studies. Bamberg & Schmidt (2003) tested Schwartz's (1977) original formulation of NAT, whereby PN is assumed to mediate AC and AR's effects on behaviour. In other words, activation of personal norms is the mechanism by which awareness of consequences and feelings of responsibility influence behaviour. Bamberg & Schmidt (2003) found evidence of this with regard to AR, but not AC. The AR-PN path was significant ( $\beta = .55, p < .05$ ), but the AC-PN path was not. Unfortunately, because AR and PN were combined in the present study, these separate effects could not be tested.

As noted above, Hunecke *et. al.* (2001) combined AR and PN. This variable had a direct effect on self-reported travel mode choice and was itself influenced by AC. Given the similarity in model structure to that reported here, some comparison is possible. In the present research, AR/PN had a significant effect on BI, which can be seen as akin to Hunecke *et. al.*'s AR/PN-behaviour effect. However, because AC and AR/PN were entered into the regression simultaneously in the analysis for hypothesis 1, no results concerning the former's influence on the latter were obtained. These two variables were quite closely correlated at  $p = .690, p < .001$ , however (see Table 5.10).

Looking at ESBs beyond travel, Guagnano *et. al.* (1995) found that AR's influence on recycling was stronger and more statistically significant than AC's, while Black *et. al.* (1985) found that AR's influence on PN was slightly stronger than AC's for reducing home thermostat settings and making minor energy curtailments (all self-reported behaviours). The present results echo these findings insofar as AR appears to have a stronger influence than AC in determining various ESBs. Comparison must be

cautious, however, since the outcome variable in the present study was BI, rather than behaviour or PN. Furthermore, AR/PN's effect may have been inflated compared to other studies using AR measures because, although feelings of responsibility and obligation could not be differentiated here, this variable may have captured a wider range of motivations. Nonetheless, with the caveat that this study was unable to test Schwartz's (1977) exact formulation of NAT, data accord with the hypothesis that drivers' car use intentions are explained by AC, AR and PN. Although the accuracy with which respondents were classified by the regression model was far from perfect, addition of NAT variables as predictors considerably improved upon the constant-only model and explained nearly 33% of variance in BI (based on  $R^2$ ).

In accordance with hypothesis 2, the TPB also explained some variance in BI.  $R^2 = .259$  and ATT, PBC and SN1 were all significant predictors. As with the NAT constructs, the TPB's classification of reducers was less satisfactory than of maintainers. There was, however, a marked improvement on the constant-only model when TPB variables were included.

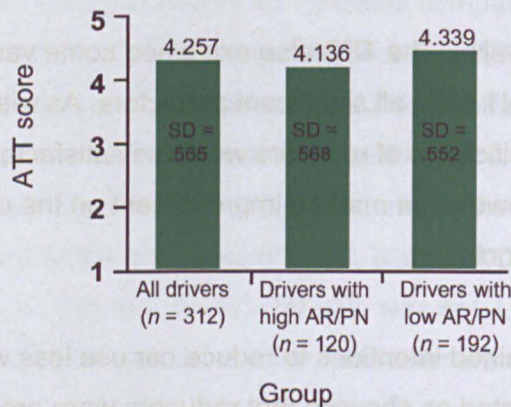
The fact that the TPB explained intentions to reduce car use less well than the NAT constructs could be interpreted as showing that reducers were predominantly motivated by altruism. This contrasts with Bamberg & Schmidt (2003), for whom NAT explained only 14% of variance in self-reported car use for university travel, while the TPB explained 45%. Their sample comprised only students, however, who were very sensitive to SN. This may account for some of the difference between their findings and those reported here. SN exerted a stronger influence on BI than any other variable in Bamberg & Schmidt's study, providing much of the TPB's explanatory power, but this is atypical. ATT and PBC generally have stronger influences on BI than SN does (Armitage & Conner, 2001); a situation reflected by the present findings.

In considering NAT's superior explanation of BI in the present study, we should note the precise nature of the intention. Rather than predicting which transport mode would be chosen from several alternatives, the study investigated intentions to *change behaviour* by reducing car use in favour of other modes. This may be seen as a sacrifice. Steg (2003, 31) found that drivers saw car travel as



more attractive than public transport because of its convenience, independence, flexibility, comfort, speed, reliability and because driving is perceived to be more pleasurable. The car also offers more status than public transport.

Such perceptions are common across travel research (see Chapter 3, section 3.3.1.1) and are echoed by drivers' attitudes towards their car use in this study. Mean ATT score was 4.257 (SD = .565), with 1 being very negative and 5 very positive in terms of convenience, flexibility, pleasantness, safety and comfort (*Figure 5.6*). The SD was the lowest of any psychological variable, suggesting that the high mean ATT score was due to generally positive attitudes rather than a few extremely high scores.



*Figure 5.6* ATT scores for all drivers and drivers split by AR/PN level

It is also notable that those with high AR/PN scores ( $n = 120$ , as in moderation analyses) had a mean ATT score of 4.136 (SD = .568), which is close to the mean ATT score of 4.339 (SD = .552) for those with low AR/PN scores ( $n = 192$ ). It seems that drivers' attitudes towards their own car use were very positive regardless of whether they felt responsible for traffic problems, or obliged to cut their car use.

Although drivers were not asked to compare car use with alternatives, it seems unlikely that other modes could compete with such positive evaluations. Since the TPB assumes that people act to maximise personal utility, it is unsurprising that compared to the NAT constructs, the TPB performed poorly in explaining intentions that may be perceived as reducing utility. NAT explains behaviour with no material benefit to the actor. It may be reasonable to characterise reducing one's car use in this way. If so, it is logical that NAT constructs should be more closely associated with intentions to reduce car use than TPB constructs.

It is acknowledged, however, that operational definition of ATT may have affected the TPB's ability to explain variance in BI. ATT items referred to driving but not *reducing* driving, while the outcome variable referred to both possibilities. To an extent, this conflicts with Ajzen's (1991a) assertion that TPB items should specify the target behaviour. In designing items, it was assumed that positive attitudes towards driving would be held alongside negative attitudes to reducing car use (Steg and Gifford, 2003). However, this denied people the chance to express the subjective expected utility (SEU), or disutility, of reducing their car use. ATT items such as 'Reducing my car use would save me time/money/effort' (*Disagree strongly/Agree strongly*) may have been useful. Although ATT was statistically significant the TPB regression, ATT items tapping the SEU of reducing car use might have uncovered more salient concerns. This may have strengthened ATT's influence on BI, increased its significance and perhaps even brought it to significance alongside non-TPB predictors.

Measurement of SN also posed some problems. SN items were entered separately in regressions because they did not form a reliable scale, but it was assumed that they could have individual effects. Steg (2005) also reports that SN items citing different referents failed to form a reliable scale and this may explain the finding here. Given the items' wording, it is perhaps unsurprising that perceptions of friends' beliefs influenced intentions, while perceptions concerning "people I know at DMU" were non-significant. Ajzen (1991a, 1995) suggests that SN items should refer to "people who are important" to participants (see Chapter 4, section 4.5.2.4). Friends are more likely to be among these people than the more general "people I know". That the study did not use Ajzen's suggested measure is acknowledged as a possible shortcoming. It was thought useful to assess the influence of perceived social pressure from different groups, although recent research suggests that it may have been better to use multiple items tapping injunctive and descriptive norms relating to the same referents (e.g. Steg, 2005).

### 5.7.2 *Interactions between psychological variables*

Entry of NAT and TPB constructs into one regression saw AR/PN and PBC emerge as significant predictors of BI, begging the question of whether PBC moderated the AR/PN-BI relationship. Madden, Ellen and Ajzen (1992, 4) note that when people believe that they have

little control over performing a behavior because of lack of requisite resources, then their intentions to perform the behavior may be low even if they have favourable attitudes and/or subjective norms concerning performance of the behavior.

This observation concerns interactions between TPB constructs, but the present study examined PBC's interaction with the NAT variable AR/PN. Was somebody who expressed responsibility and obligation for reducing their car use, but little control over it, as likely to state an intention to drive less as somebody expressing the same feelings of responsibility and obligation, but greater control? Contingency tables were used in the analysis (Bryman & Cramer, 2001), with AR/PN and PBC split around their medians to create 'high' and 'low' groups. Although median splits have been criticised for assuming that all values on one side of a split are identical (Wright, 2003), the technique was used because it was impossible to create contingency tables with cells for all values of AR/PN and PBC.

As hypothesised, PBC partially moderated the AR/PN-BI relationship. While AR/PN-BI association was significant at both levels of PBC, it was stronger and more significant at high than at low levels. PBC's possible role as a moderator of other psychological variables' (TPB or otherwise) effects on BI has received little research attention (Armitage, 2003). Even interactions among TPB constructs are rarely investigated (although see Conner & McMillan, 1999; Madden *et al.*, 1992), so research on PBC's interaction with non-TPB variables is especially novel.

SN's non-significance in the model using both NAT and TPB constructs may be explained by AR/PN accounting for the perceived wishes of others (Steg, 2004). Indeed, Schwartz (1977, 271) proposed that SN is "built into" PN and Harland *et al.* (1999) provide evidence of this in relation to five ESBs including travel mode choice (see Chapter 4, section 4.5.2.4).

AR's relationship with SN may be similar. Perceived social pressure might engender feelings of personal responsibility. If so, we would expect SN's influence to be lessened by AR's inclusion. Unfortunately, due to treatment of AR and PN as a single variable, their individual effects on SN could not be quantified.

Harland *et al.* (Ibid.) also found that addition of PN to the TPB reduced ATT's influence on BI in all five of their tests and lessened significance in two, including intentions to



reduce car use. Like the present study's findings, this indicates that personal-normative considerations can override non-moral attitudes in the ESB domain. There is clearer support for this in Harland *et. al.*'s study, where PN was not linked to AR. In the present study, it is impossible to say whether the effect on ATT's contribution to BI was due to PN, AR, or both. Nonetheless, it seemed that drivers saw decisions to reduce car use as predominantly moral, but moral beliefs' influence on BI was partially determined by feelings of control. When feelings of responsibility and obligation were taken into account alongside self-interested attitudes, the latter proved non-significant.

AC was also non-significant when entered into a regression with TPB variables. Although salient when only NAT variables were considered, it seemed to be less important to people's car use intentions (and statistically insignificant) once PBC was added, as perceived control was apparently a crucial determinant of BI.

The model comprising AR/PN and PBC classified participants more accurately than NAT constructs or the TPB alone. It also explained more variance in BI and achieved a better balance between fit and parsimony; illustrated by its AIC and SIC values. This accords with hypothesis 3. Apparently, as Harland *et. al.* (Ibid., 2523) suggest, "none of the TPB constructs entirely captures the influence of moral considerations on intentions to perform environmentally relevant behaviours". Ensuring that models include a moral (personal normative and personal responsibility) element may be especially important where behaviours might result in reduced personal utility. It is not certain that drivers in this study believed that reducing their car use would involve sacrifice, but it is feasible, given their very favourable evaluations of driving.

### 5.7.3 *The importance of context to intention formation*

#### 5.7.3.1 *Physical context*

Explanation of variance, accuracy of predicted intentions and fit-parsimony balance were further improved by including measures of actual and perceived context in the model. AR/PN and PBC were again the only significant psychological predictors and eight contextual variables were also significant at .05 level.

Most of their effects match *a priori* expectations, although a quantitative study cannot show definitively *why* a variable has a particular influence. Without qualitative explanations, we must speculate in a manner congruent with psychological theory and

common sense. For example, bicycle owners may have been more likely to express intentions to reduce their car use than non-owners because they had access to this alternative transport mode. Among people expressing high levels of AR/PN, the AR/PN-BI correlation was very weak and non-significant for those not owning a bicycle, but moderate and highly significant for those owning a bicycle. This suggests that whether drivers owned a bicycle had an important influence on whether feelings of responsibility and obligation led to intentions to reduce car use.

The more people a driver takes to DMU, the more difficult they may find reducing their car use because of responsibilities to others. Again, there was a partial moderating effect on AR/PN-BI association, which was stronger and more significant for lone drivers than for those taking passengers.

The more expensive driving is perceived to be, the more inclined drivers may be to seek a cheaper alternative. As with bicycle ownership and passenger carriage, perception of driving as expensive had an additive effect on BI with AR/PN. Such effects are described by Corraliza and Berenguer (2000, 832).

When high conflict level is generated between personal dispositions and situational conditions, the predictive power of attitudes tends to be minimal, whereas in the case of consistency between them it tends to be maximal.

We should note that despite their assertions to the contrary, Corraliza & Berenguer (ibid.) only measured *perceived* context. Nonetheless, their proposal is interesting. It is supported by Hunecke *et al.*'s (2001) reported interactions between psychological and contextual variables in determining subway use and by the interactions found in the present study and described above. But the additive model contrasts with Guagnano *et al.*'s (1995) attitude-behaviour-context (A-B-C) model. This postulates that psychological variables are most strongly associated with pro-environmental BI and/or behaviour when the strength of contextual influences is moderate. At high or low strength, psychological variables should have little effect because the behaviour is either so easy that even people without strong pro-environmental motivation will perform it, or so hard that even the strongest pro-environmental motivations are insufficient to overcome the barriers. The A-B-C model is illustrated in *Figure 5.7a* and the additive model in *Figure 5.7b*.

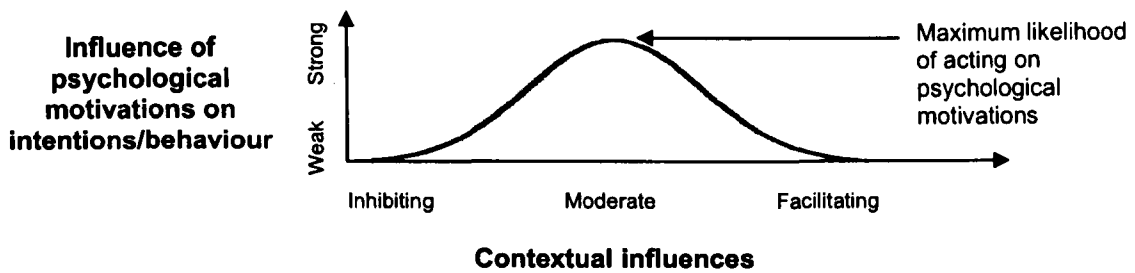


Figure 5.7a A-B-C model of psychological-contextual interactions

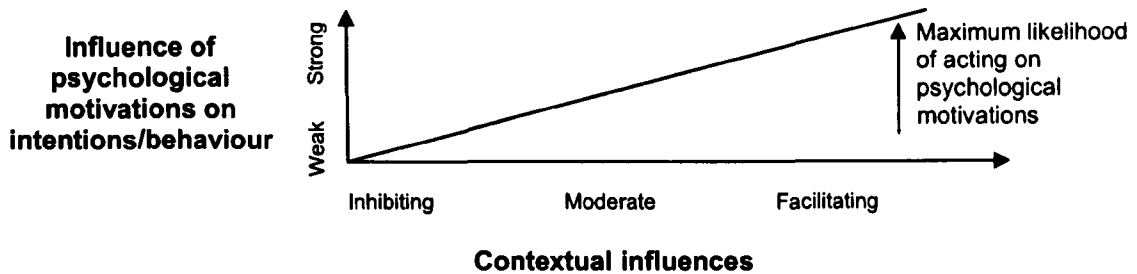


Figure 5.7b Additive model of psychological-contextual interactions

Journey time's interaction with AR/PN indicates that the A-B-C model can apply to influences on car use intentions. The longer drivers said commuting took, the less likely they were to express intentions to reduce car use. This could be because temporally-longer journeys seem more onerous by bicycle, on foot, or by public transport. Of participants with high AR/PN, those with journeys taking the least time were most likely to intend to reduce their car use and those whose journeys took the longest were least likely to express this intention. Looking at AR/PN-BI correlations for the three groups, however, only those in the middle time bracket (21-40 minutes) showed a significant ( $p < .05$ ) association, which was also the strongest ( $r = .297$ ) of any group. Perhaps temporally-short journeys pose few obstacles to reducing car use, so strong motivations for doing so are not required to overcome contextual barriers to forming intentions. This highlights the fact that not all contextual influences interact with psychological variables in the same way; something that should be remembered when the effects of context on BI and/or behaviour are investigated.

The effect of journey distance on BI is less easily explained. Commuting over greater distances was associated with higher odds of expressing intentions to reduce car use. It is not clear why this should be when longer journey *times* were associated with

reduced odds of expressing this intention. Contingency tables revealed no pattern to the interaction of distance and AR/PN. One important point is that there probably is not a simple linear relationship between journey time and distance. A journey through heavy traffic may cover a short distance in a long time, while clear roads may allow coverage of a greater distance more quickly. This, in itself, does not explain the results obtained here. It does suggest, however, that the relationship between journey distance and time may not be straightforward and that the nature of the journey (busy or clear roads, urban or rural, what the speed limit is, etc.) may influence decisions about whether it would be best to use a non-car mode.

#### 5.7.3.2 *Socio-demographics*

Turning to socio-demographic variables, age was inversely related to intentions to reduce car use. Older participants may have been less willing to change modes due to the extra physical effort of walking, cycling or taking public transport. Such extra effort, if undesired, would mean reduced personal utility. Unfortunately, as the ATT scale did not tap the SEU of *reducing* car use, it is impossible to say whether older and younger respondents differed in perceptions of the utility or disutility of the target behaviour. It may also be that older drivers have more entrenched travel habits, making them less likely to consider changing modes than younger drivers. This issue deserves attention, since habit has been shown to influence travel behaviour (see Chapter 3, section 3.3.3 and Chapter 6, section 6.5.1.8).

Higher income was also associated with lower odds of expressing intentions to reduce car use. Perhaps higher earners do not consider any financial savings arising from modal switch to be important. Alternatively, they may value the status conferred by driving. Or, as Kuppam & Pendyala (2001) found, higher earners may combine more non-work activities with commuting, making car use especially attractive.

Part-time members of DMU were more likely than full-timers to express intentions to reduce their car use. This may be because part-timers have more varied routines and less entrenched travel habits, because not travelling daily during peak periods allows greater flexibility over modal choice, or because they are generally lower earners. Again, while these explanations seem plausible, they cannot be definitively accepted or rejected on the basis of a quantitative analysis.

#### 5.7.4 Summary of main discussion points

What the analysis does show is that the model comprising psychological and contextual variables explained more variance in BI, correctly classified more participants and struck a better balance between fit and parsimony than any of the models comprising only psychological constructs. While moral concerns influenced BI, PBC – and contextual factors independent of PBC – partially determined whether drivers' stated intentions reflected these concerns. Data support the hypothesis that addition of contextual variables to psychological variables increases explained variance in car use intentions. The generalisability of this finding to other ESBs is limited, as different behaviours are likely to be facilitated or constrained by quite different contextual influences. But the present results do accord with other studies showing that contextual as well as psychological factors determine ESB and ESB intentions (e.g. Black *et. al.*, 1985; Hunecke *et. al.*, 2001).

### 5.8 Limitations

Use of BI as an outcome variable is common in ESB research, but use of behaviour is preferable. Although BI is a proven predictor of behaviour, intervening factors can break this relationship and the present study did not examine these. In a study of car use, however, people may be aware of many relevant contextual factors before forming intentions. For example, drivers seem unlikely to form definite intentions to switch to public transport without first establishing that appropriate services exist. Insofar as perceptions of context are accurate they should be captured by PBC, but the extent of participants' knowledge of issues such as public transport availability is uncertain.

Use of BI as an outcome variable in NAT research is particularly open to criticism, as Schwartz's (1977) model does not include this construct. In the absence of a behaviour measure, however, this approach was necessary to enable comparison of NAT and TPB models as explanations of the same outcome. While not theoretically ideal, NAT constructs explained more variance in BI than the TPB, empirically justifying the approach.

A further limitation was that the study tested a model *based on* NAT, rather than Schwartz's (*Ibid.*) exact formulation. Due to the failure to distinguish AR from PN, they were treated together. Although this is not a unique approach, it does contrast with research treating AR and PN as distinct; the former often influencing the latter (e.g.



Stern *et. al.*, 1999). In the present study, however, data dictated that a combined variable should be used. As this reflected respondents' apparent inability to differentiate between the constructs, this can be considered a useful finding in itself.

Some shortcomings of the ATT and SN items have been identified. Possible effects on ATT's contribution to explanation of intentions were discussed in section 5.7.1. Finally, as suggested in section 5.2.1, it may have been useful to examine affective aspects of car use, alongside the (largely) instrumental evaluations captured by the ATT scale.

## **5.9 Conclusions**

This study indicates that drivers who stated intentions (BI) to reduce their car use for travel to DMU were motivated more by moral concerns than self-interest. Personal responsibility and obligation (AR/PN) exerted a significant influence on BI when entered into a regression with TPB variables, while self-interested beliefs (ATT) did not. Non-moral concerns did influence intentions, however, as evidenced by the effect of PBC alongside AR/PN. Even when someone feels moral motivation for reducing their car use, its effect may be constrained by a perceived lack of control.

It is logical that NAT constructs should be more salient than TPB constructs in influencing intentions to reduce car use. For many drivers, switching modes may decrease convenience, comfort and flexibility, requiring increased effort. The view of car use as a social dilemma illustrates this (see Chapter 3, section 3.5). Individuals often make few short-term gains from changing a behaviour with numerous personal advantages. In this socio-cultural context, heavily weighted in favour of driving, decisions to use alternative modes are likely to rest on something other than personal utility; a willingness to make personal sacrifices for a wider goal. It is, therefore, unsurprising that the altruism-based NAT constructs captured motivations for reducing car use more effectively than an SEU theory like the TPB.

Car use intentions were also influenced by perceived and actual physical context and by socio-demographics. Inclusion of these variables alongside AR/PN and PBC improved the accuracy with which drivers were classified, raised level of explained variance in BI and improved the model specification. As such, it is concluded that psychological factors alone were insufficient (insofar as any combination of variables

can be considered sufficient) to predict drivers' car use intentions and that contextual variables should be included in models with this aim.

There are at least two possible reasons for the fact that even a model comprising psychological, physical-contextual and socio-demographic variables was unable to explain over half the variance in BI. Both may apply. Firstly, some unexplained variance is probably random and cannot be explained deterministically. Secondly, factors not measured in this study may be important in motivating reduced car use. These might include role beliefs (e.g. Bamberg & Schmidt, 2003), habit (e.g. *Ibid.*; Matthies *et. al.*, 2002) affect (e.g. Bamberg & Schmidt, 2003) and social-symbolic motives (e.g. Steg, 2005). Indeed, Bamberg & Schmidt (2003) compared Triandis' (1977) theory of interpersonal behaviour (TIB) with NAT and the TPB in terms of ability to explain travel mode choice. The TIB contains role beliefs, habit and affect, alongside PN, behavioural beliefs (of the sort underlying ATT), control beliefs (of the sort underlying PBC) and normative beliefs (of the sort underlying SN). In Bamberg and Schmidt's (2003) study, this model explained 68% of variance in BI and 51% of variance in self-reported modal choice; more than either NAT or the TPB. Given the TIB's ability to explain modal choice from several options, it would be useful to see whether it could also explain drivers' decisions to switch modes. In light of the present results, it seems possible that the TIB, with the addition of AR and contextual variables such as bicycle ownership, could be successful in this regard.

The present findings could be useful in developing DMU travel policy. Since AR/PN and PBC were the most influential psychological variables, interventions aimed at reducing car use for university travel could target these motivations. Encouraging acceptance of responsibility for travel-related problems and feelings of obligation for addressing them could help to raise levels of AR and PN, but there is a danger of causing reactance, leading drivers to deliberately avoid switching modes (see Chapter 3, section 3.4). It may be easier to influence PBC by highlighting available opportunities for reducing car use and/or demonstrating how others have done so. Similarly, measures to increase ownership of (or access to) bicycles may be effective and DMU has already introduced car park charges, raising the cost of car travel.

This study also suggests ways of targeting interventions. Those most likely to express intentions to reduce their car use were generally young, part-time and lower earners.

Such people may be more easily persuaded to switch modes than other members of DMU. It may also be fruitful to target bicycle owners and lone drivers, as these variables partially moderated moral motives' influence on BI. DMU initiatives to reduce car use may be best directed at these groups in the first instance. Interventions aimed at those who may prove harder to persuade should only be pursued once the 'easy pickings' have been harvested.

This study highlights several avenues that could be explored by qualitative work, enabling explanations in participants' own terms. For example, it would be interesting to explore how people manage any dissonance caused by holding very positive attitudes to driving at the same time as anti-driving moral beliefs, or why people generally seem to express low control over how they commute. In the words of Fodor and Pylyshyn (1981, 154), "the goal of psychological theory construction is not to predict most (or even all) of the variance; it is to explicate the underlying mechanisms upon whose operation the variance depends". Identifying statistically significant influences is the first step. Asking why they are significant – what they mean to people and how they are presented in people's own accounts of their behaviour – enables deeper understanding. This was the broad aim of study 2, reported in Chapter 6.

## **Chapter 6**

### ***Study 2: a qualitative study of travel mode choice for commuting***

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#### **6.1 Abstract**

Semi-structured interviews were undertaken with 24 commuters to DMU (13 female, 11 male). Study 1, which involved these participants, applied Schwartz's (1977) norm-activation theory (NAT) and Ajzen's (1991; 1991a) theory of planned behaviour (TPB) to explain intentions to reduce or maintain car use for commuting. Study 2 interviews were analysed to see whether people used vocabularies and discourses (see Chapter 2, section 2.3) reflecting these theories when explaining their commuting behaviour and to identify any other shared stances on travel to work. Several discourses echoing NAT and TPB constructs were identified; driving as necessary (echoing perceived behavioural control from the TPB), the car as practical and the car as impractical (both echoing attitude towards the behaviour from the TPB), driving as morally problematic (echoing NAT's ascription of responsibility and personal norm constructs), anti- and pro-driving social norms (echoing subjective norms from the TPB) and car use consequences (echoing NAT's awareness of consequences construct). Discourses referring to affective motives and driving through habit and laziness were also evident. The most striking findings concern the importance placed on perceived behavioural control and the extent to which people characterised driving as necessary because of their context. Some said that they had only been able to act on motives for using non-car modes (e.g. personal norms and affect) after contextual changes that had widened their perceived choice of commuting modes. Prochaska's (Prochaska & Norcross, 2001) transtheoretical model was applied as a means of illuminating the process of switching modes. Although some doubts are raised about its applicability in this behavioural domain, people expressing both moral and self-interested motives for avoiding driving were more likely to report having moved towards behaviour change than those expressing only one of these types of motive.

#### **6.2 Approach and aims**

Study 1 examined influences on commuting intentions across a large sample, but did not focus on individuals. Moreover, people chose from set response options, many relating to Schwartz's (1977) norm-activation theory (NAT) and Ajzen's (1991; 1991a)

theory of planned behaviour (TPB). In study 2, however, participants answered open-ended interview questions and could raise their own concerns. This echoes Glaser and Strauss' (1967) grounded theory methodology, whereby researchers develop theories to explain "action from the perspective of the human agent" (Haig, 1995, 1).

The grounded theory literature differs on whether analysis can and should be free of assumptions from beyond the data. Glaser & Strauss (1967) asserted that researchers should not bring *a priori* ideas to analyses, while others argue that everyone has an "orienting theory" (Kinach, 1995, 2). This latter view appears dominant among contemporary grounded theorists (Layder, 1993), with Strauss himself recently adopting a softer position (Strauss and Corbin, 1998). In the present study, which built directly on study 1, some *a priori* ideas were inevitable. Although analysis was open to any explanations of commuting behaviour, it was decided in advance that questions relating to NAT and the TPB would be asked (see section 6.4.2) in order to assess the extent to which people's talk echoed these theories.

Robson (2002) notes that an approach like this – using multiple methods to address one issue – can combat 'inappropriate certainty'; the idea that a clear-cut result obtained by one method is 'right'. However, where conflicting results are found, one must try to explain the inconsistency and decide which, if any, findings are valid.

Nonetheless, opening up the possibility of such conflicts seems preferable to relying on a single method when more can be used. We cannot "avoid the confounding effects of methods on our measurements... Using a logic equivalent to that of classical test theory, the error due to methods is regarded as tending to average out when multiple methods are used" (Ibid., 371). To some extent, this logic drove the mixed-method approach of this thesis, although the studies reported in Chapter 5 and here were sufficiently different (e.g. in sample size and hypotheses/research questions) that this was not 'triangulation' in the strict sense of "checking the results" (Ibid., 373) of one method by using another. Rather, studies 1 and 2 were complementary. Interpretation of quantitative results was enhanced by analysis of qualitative data.

Study 2 aimed to identify positions on car use and other modes for commuting. There was a focus on shared vocabularies and discourses – those used by more than one person – for two reasons. Firstly, it was thought most useful to identify common

stances. Seeing whether multiple participants raised the same issues was a means of establishing how prevalent different positions were among the sample. Secondly – and more pragmatically – a strict focus was necessary due to time constraints. Concentrating on ideas invoked in multiple accounts ensured a manageable analysis within the time available.

### **6.3 Research question**

Study 2 addressed a single, broad question: what shared discourses do participants use to explain their commuting behaviour? However, as well as information relating to this question, the study provided other data, especially regarding behaviour change. Neither NAT nor the TPB was developed to explain such change, so Prochaska's (Prochaska & Norcross, 2001) transtheoretical model (TTM) was applied as a possible means of understanding the process of switching travel modes (see also Huguenin, 2005). Thus, as well as answering the above question, the study included some additional analysis.

### **6.4 Method**

#### **6.4.1 Participants**

The study 1 questionnaire asked whether people would “like to participate in further research”. Of 312 drivers included in study 1 regressions, 79 answered “yes”. Study 2 participants were drawn from this pool.

To try to ensure various motives for commuting mode choices among study 2 participants, study 1 standardised residuals were used. A residual is the difference between the observed dependent variable value and that predicted by a regression model, indicating how much information in a case's data is unexplained. The closer the value is to 0, the better the model's fit. Using standardised residuals from the NAT and TPB regressions (study 1 hypotheses 1 and 2), the aim was to identify four groups; individuals for whom only NAT was a ‘good fit’, for whom only the TPB was a ‘good fit’, for whom both were a ‘good fit’ and for whom neither was a ‘good fit’.

Participants who had expressed intentions to reduce car use (‘reducers’) were selected separately from those who had expressed intentions to maintain car use (‘maintainers’). The procedure was as follows.

1. Drivers included in study 1 analyses who agreed to participate in further research and expressed intentions to reduce car use were identified ( $n = 21$ ).
2. The median of their NAT regression standardised residuals was calculated.
3. The median of their TPB regression standardised residuals was calculated.
4. Anyone whose NAT standardised residual was below the median and whose TPB residual was above the median was classed as 'NAT only good fit'.
5. Anyone whose TPB standardised residual was below the median and whose NAT residual was above the median was classed as 'TPB only good fit'.
6. Anyone whose standardised residuals from both regressions were below the medians was classed as 'both models good fit'.
7. Anyone whose standardised residuals from both regressions were above the medians was classed as 'neither model good fit'.

This gave groups with the following membership.

- 'NAT only good fit'  $n = 4$
- 'TPB only good fit'  $n = 3$
- 'both good fit'  $n = 9$
- 'neither good fit'  $n = 5$

The term 'good fit' is relative. The small pool of potential participants meant that people could be assigned to a 'good fit' group when their standardised residual was only just below the median. Nonetheless, these people had data for which the relevant model was a *better* fit than those excluded from the group.

The procedure was repeated for maintainers, with the initial pool comprising 58 people. The groups had the following membership.

- 'NAT only good fit'  $n = 10$
- 'TPB only good fit'  $n = 13$
- 'both good fit'  $n = 21$
- 'neither good fit'  $n = 14$

The smallest group was reducers with 'TPB only good fit' ( $n = 3$ ). It was decided that data should be gathered from three members of each group, to achieve the largest possible equal group size. The target number of participants was, therefore, 24.

The standardised residuals of members of each group were examined and the three for whom the group name was most appropriate were chosen. For example, of the 13 'TPB only good fit' maintainers, the three with the smallest TPB standardised residuals were chosen. In the 'both good fit' groups, each person's standardised residuals from the two regressions were summed and the three with the smallest combined values were chosen. In the 'neither good fit' groups, each person's standardised residuals were summed and the three with the largest combined values were chosen.

Twenty-three of the 24 selected people agreed to participate. One, a 'both good fit' maintainer, was non-contactable. The member of this group with the next-lowest combined standardised residual value participated instead. Participants' details are summarised in *Table 6.1*. Names are pseudonyms, protecting privacy whilst conveying that participants are real people (Manzo, 2004).

Intention	Group	Name	Gender	Age	Job type	Full- or part-time	Income band
Reduce car use	'NAT good fit'	Les	m	60+	academic	ft	£40,000 or over
		Alun	m	20-29	postgraduate	ft	£10,000-£19,999
		Patricia	f	20-29	postgraduate	ft	under £10,000
	'TPB good fit'	Frances	f	30-39	academic	ft	£20,000-£29,999
		Ernie	m	40-49	non-admin support	ft	£20,000-£29,999
		Rick	m	40-49	admin support	ft	£20,000-£29,999
	'Both good fit'	Owen	m	60+	academic	pt	£20,000-£29,999
		Sue	f	30-39	admin support	pt	under £10,000
		Denise	f	40-49	academic	ft	£20,000-£29,999
	'Neither good fit'	Monica	f	30-39	admin support	ft	£20,000-£29,999
		Wendy	f	30-39	academic	pt	£10,000-£19,999
		Nigel	m	20-29	admin support	ft	£10,000-£19,999
Maintain car use	'NAT good fit'	Vic	m	30-39	academic	ft	£20,000-£29,999
		Beryl	f	40-49	admin support	ft	£10,000-£19,999
		Harry	m	50-59	admin support	ft	£30,000-£39,999
	'TPB good fit'	Zoe	f	40-49	postgraduate	ft	under £10,000
		Georgina	f	50-59	non-admin support	pt	£10,000-£19,999
		Jacky	f	30-39	admin support	ft	£10,000-£19,999
	'Both good fit'	Ursula	f	40-49	academic	ft	£30,000-£39,999
		Ian	m	50-59	academic	ft	£30,000-£39,999
		Kath	f	50-59	academic	ft	£40,000 or over
	'Neither good fit'	Tina	f	60+	non-admin support	pt	under £10,000
		Bryan	m	50-59	academic	ft	£30,000-£39,999
		Carl	m	30-39	admin support	ft	£10,000-£19,999

*Table 6.1* Study 2 participants



*Table 6.2* compares study 1 and study 2 participants' socio-demographic characteristics. The latter were reasonably representative of the former, although generally slightly older and higher-earning. This may be because study 2 contained a higher proportion of academic staff. It also had a more equal gender balance.

Characteristic		Study 1 (%) <sup>a</sup>	Study 2 (%) <sup>b</sup>
Gender	female	63.8	54.2
	male	31.5	45.8
Age band	under 20	1.1	0.0
	20-29	12.6	12.5
	30-39	29.3	29.2
	40-49	25.8	25.0
	50-59	5.0	20.8
	60+	4.1	12.5
Job type	undergraduate	8.0	0.0
	postgraduate	1.5	12.5
	non-admin support	18.0	12.5
	admin support	38.4	33.3
	academic	30.8	41.7
Full- or part-time	full-time	75.0	79.2
	part-time	20.4	20.8
Income band	under £10,000	17.4	16.7
	£10,000-£19,999	30.6	29.2
	£20,000-£29,999	18.2	29.2
	£30,000-£39,999	16.7	16.7
	£40,000 or over	8.2	8.3

<sup>a</sup> percentages do not always total 100 due to missing data

<sup>b</sup> percentages do not always total 100 due to rounding

*Table 6.2* Socio-demographic comparison of study 1 and study 2 participants

One reason for using interviews in study 2 was to understand and convey people's individuality. This is difficult without repeating socio-demographic details with every quotation. Although excerpts are attributed to the appropriate participant, readers are encouraged to refer to *Table 6.1* for a reminder of who provided data.

#### 6.4.2 Data collection

Twenty-four semi-structured interviews were conducted in various locations during April 2004 (*Table 6.3*). It has been argued that varying locations introduces inconsistency because "in one location a participant may assert one identity... and in another answer questions from a different perspective" (Elwood and Martin, 2000, 652). However, each participant chose their interview location to ensure comfort and convenience for them.

Location	<i>n</i> interviews
Meeting room in researcher's department at DMU	11
Meeting room in participant's department at DMU	7
Participant's office at DMU	4
Participant's home	1
Café on campus	1

*Table 6.3 Interview locations*

All interviews were conducted by the author, to minimise researcher effects that may bias data (Breakwell, 2000). The interview schedule is provided in Appendix 2 and was developed through five pilots with people who agreed to participate in further research during study 1 but were not selected for study 2. They were informed of the pilots' purpose when contacted and were told that data would not be analysed.

Interview questions were open-ended and allowed participants to discuss commuting in their terms. Questions tapping motives for commuting behaviour were drawn from various sources, including NAT and the TPB. NAT constructs were operationally defined as awareness of commuting behaviour's consequences (AC), acceptance of responsibility for these (AR) and obligation for avoiding or minimising car use and/or guilt over driving (PN). TPB constructs were operationally defined as attitudes towards using various modes for commuting (ATT), perceived control over commuting mode choice (PBC) and subjective norms surrounding commuting mode choice (SN).

Study 1 suggested that commuting intentions were influenced by various contextual factors; bicycle ownership, perceived cost of driving, journey time, journey distance and carriage of passengers when commuting. Questions tapping each of these issues were included in the interviews.

Questions were also based on findings from other travel research (see Chapter 3). These covered privacy and independence (e.g. Hagman, 2003), affect and self-image (e.g. Steg, 2005), status (e.g. Hjorthol, 2001), habit and role beliefs (e.g. Bamberg & Schmidt, 2003), financial and time costs (e.g. Bergström & Magnusson, 2003), combining commuting with other trips, needing to travel during the working day (e.g. Gatersleben, 2003) and the social dilemma of driving (e.g. Fujii *et. al.*, 2001).

These issues were tapped by twelve questions. Some asked directly about an issue (e.g. SN was tapped by asking "Can you tell me about any ways in which other people

influence how you travel?"), while broader questions were posed to capture various motives without being leading (e.g. "Do you feel that your decisions about how to travel say anything about you as a person?"). Before posing the questions, the researcher asked each participant for permission to record their interview. Once granted (it was in all cases), the tape was started.

After answering the questions, participants undertook a simplified multiple sorting procedure (Canter, Brown and Groat, 1985). The full procedure was piloted, but interviewees had difficulty understanding it and generally seemed unable to group influences on their commuting mode choice. Therefore, the task was changed so that participants ranked influences in order of importance. They were given post-it notes and asked to write one influence on how they commuted per note, using as many as necessary. They were also asked to say when they had finished. At this point, if a participant had omitted any previously discussed influence, the researcher asked whether this should be included. Decisions about whether to include suggestions were left to the participant. Once the participant stated that all influences had been listed, s/he was asked to arrange them in descending order of importance. The researcher checked that the task was finished and collected the notes in order.

At the end of each interview, participants were asked if they would like to add anything, thanked and asked if they would like to see the finished research report. Finally, they were asked to complete a post-interview questionnaire (Clarke and Robertson, 2001) and given a pre-paid envelope in which to return it. The questionnaire (Appendix 3) was designed to check for sources of bias. The tape was then stopped and the interview closed.

#### 6.4.3 *Transcription*

Interviews were transcribed using a simplified Jefferson system (Psathas, 1995). In the examples below, 'R' indicates researcher and 'I' indicates interviewee.

##### 1. Overlapping speech turns: enclosed in [ ]

R: Would you think about coming by another means [or would you still-]

I: [I'd probably come] by bus.

##### 2. Contiguous utterances (i.e. no interval): indicated by =

I: I have to, you know, get my kids to childcare and pick them up before five o'clock, so I am dictated to by time.=

R: =Sure.

3. Cut off speech turns (i.e. one speaker interrupted by another): indicated by -

R: In a sense, is it your kids that are dictating-

I: Yeah, I suppose

4. Emphasis: indicated by *italics*

I: So, er, ((laughs)) the A6 is an absolute *nightmare*

5. Pauses: indicated by ((pause))

I: Um, ((pause)) right, um,

On average, interviews lasted 54 minutes. Wendy's interview did not record due to equipment failure, but still yielded useful data as field notes and ranking task post-it notes were used to reconstruct her account.

#### 6.4.4 *Template analysis*

Data were analysed using King's (1998) template analysis method. This is compatible with any epistemological position, allows for *a priori* themes and provides an 'audit trail' of successive template iterations. Analysis involved nine steps.

1. *Transcription and case summaries.* Interviews were transcribed and a one-page summary of each participant's account was written.

2. *Define a priori themes.* These included NAT and TPB constructs and the other potential influences on commuting mode listed in section 6.4.2 (*Table 6.4*).

3. *Initial coding.* Using eight transcripts (one reducer and one maintainer from each 'good fit' group) themes were identified in the data and text was labelled with the relevant codes. For example, where somebody expressed guilt over driving, text was coded as referring to the guilt component of PN (Guilt<sub>(PN)</sub>). Where an influence on commuting behaviour was not captured by an *a priori* theme, a new theme was devised. For example, when somebody spoke of their car's reliability, a new second-order theme was added under the top-level ATT theme (Reliability<sub>(ATT)</sub>).

Theme type	Top-level theme	Second-order theme
NAT	Anti-driving personal norm (PN)	Moral obligation not to drive Guilt over driving
	Personal responsibility for commuting consequences (AR)	
	Awareness of consequences of own commuting (AC)	
	Awareness of consequences of travel generally (AC)	
TPB	Attitude towards use of different modes for commuting (ATT)	Comfort Convenience Flexibility Safety Speed
	Perceived control over commuting mode choice (PBC)	Ease/difficulty Volitional control
	Subjective norm (SN)	Descriptive Injunctive
Other psychological	Affect	
	Habit	
	Self-image	
	Status	
Contextual	Bicycle ownership	
	Carriage of passengers on commute	
	Cost	Cost of driving Cost of non-car modes
	Journey distance	
	Journey time	

*Table 6.4 A priori themes*

**4. Develop initial template.** Themes identified in step 3 were grouped hierarchically. For example, participants' attitudes towards different modes for commuting included evaluations of reliability and speed. Each of these was a second-order theme under the top-level ATT theme. Themes were tabulated in the initial template (Appendix 4).

**5. Inter-coder reliability.** One transcript coded for step 3 (Denise) was re-coded using the initial template. It was also coded by another researcher, to whom the initial template was provided and explained. The following formula was used to establish the level of agreement between researchers (Miles and Huberman, 1994).

$$\% \text{ reliability} = \text{agreements} / (\text{agreements} + \text{disagreements}) \times 100$$

Initially there was 69% agreement, rising to 98% after discussion. The major cause of disagreement was that the author only coded data referring to influences on commuting. The second researcher, however, coded any mention of a theme. It was agreed that when coding a second transcript, both researchers would only code clear references to commuting.

There was initial agreement on 88% of codes in the second transcript (Harry), rising to 100% after discussion. The only repeated disagreement concerned the Flexibility<sub>(ATT)</sub> and Freedom codes (see Appendix 4). On three occasions the author applied the former code where the second researcher applied the latter, because the second researcher did not appreciate the difference in specificity. Flexibility<sub>(ATT)</sub> referred to ability to make a specific journey at a specific time, while Freedom was defined as general ability to travel at will.

Miles & Huberman (ibid., 64) suggest that “intercoder agreement should be in the 90% range”. It was therefore decided that agreement was acceptable. The themes seemed to be adequately defined and the author’s decisions about where to apply codes appeared to be justifiable (Robson, 2002).

6. *Develop template.* The initial template was applied to all transcripts. Where data relevant to the research question did not fit the template, a code was added or modified to capture those data. This required re-coding of previously coded transcripts to reflect changes to the template. Each transcript was coded four times before no further changes were required. Appendix 5 shows the final template.

7. *Interpretation.* This involved various operations.

- A cognitive map (Miles & Huberman, 1994) was produced for each participant, showing commuting mode(s), themes raised in the interview and how they seemed to be related.
- Decision trees (ibid.) were produced for all participants who commuted by different modes on different days. These illustrated the decision processes used to chose a mode.
- Prochaska’s (Prochaska & Norcross, 2001) TTM was applied to each transcript. The TTM posits five stages of behaviour change. Each participant was categorised as being at one stage (see section 6.5.3). Themes used by each participant to explain their modal choice were listed alongside their TTM stage, showing whether people at the same stage raised similar issues.

8. *Validation*. Abstracted representations (e.g. cognitive maps) were compared to raw data to assess whether they reflected participants' accounts. Alterations were made where claims could not be justified by the data.

9. *Member-checking*. Although King (1998) specifies only eight steps, a ninth was added as an extra validity check. Miles & Huberman (1994, 275) comment that "one of the most logical sources of corroboration is the people you have talked with". This is the 'member-checking' recommended by Guba (1981) and Robson (2002), which can guard "against researcher bias" (Ibid., 175).

Robson (Ibid.) suggests contacting a sub-sample of participants as this should indicate any wider problems with the analysis. Accordingly, four randomly-selected participants were provided with their own one-page case summaries and cognitive maps (by email). These were non-technical, using terms such as 'feels obliged' rather than 'personal norm' (Miles & Huberman, 1994). Participants were asked to comment (by email) on the accuracy of the researcher's account of their commuting behaviour. There were no major criticisms, although two participants said that the researcher had mistakenly identified one influence on their commuting mode choice. The relevant themes had been mentioned at interview, but during member-checking the participants claimed not to have cited them as influences on commuting specifically. For example, one had said that he often drove because he owned a car and paying for trains seemed wasteful. However, during member-checking he argued that he had meant this with reference to leisure trips and that he had different reasons for commuting by car. Reviewing the transcript, the researcher found that the link to commuting was questionable. This prompted re-coding of all 24 transcripts with stricter application of decision rules (see section 6.4.5) and subsequent revision of cognitive maps, decision trees and so on.

The rationale for member-checking can be questioned. Efforts to eliminate bias in steps 1 to 8 could be undone by changing interpretations at participants' request. But "a supine giving in to any criticism is not called for" (Robson, 2002, 175). If decision rules are adhered to, the process is a useful validity check. Indeed, all transcripts had already been re-coded four times before member-checking (step 6), so it was seen as simply another stage in refining the analysis through close attention to data.

#### 6.4.5 Decision rules

Decision rules govern coding, helping to ensure that codes are applied to all instances of a theme, but only those instances (internal reliability) and that applications are justified (validity). Three rules were developed to guide identification of reasons given by participants for using particular commuting modes.

1. *A code should be applied when data refer specifically to commuting.* For example, Beryl mentioned the convenience of driving to DMU. She referred specifically to commuting, so the Convenience<sub>(ATT)</sub> code was applied.  
I: I cut through the back way... that's very convenient. It cuts out a lot of the queuing.
2. *Even if a participant does not use the word by which a theme is identified in the template, the code should be applied if the theme captures the comment.*  
Ursula provides an example.  
I: If my car was off the road, I don't know what I'd do now.  
She stated that she had to drive to DMU. She did not use terms like 'perceived behavioural control', but this theme was relevant. The Volitional control<sub>(PBC)</sub> code was applied.
3. *A code should be applied when a participant is not referring specifically to commuting if comments also apply to commuting.* Again, Ursula provides an example.  
R: What are the opportunities not to drive?  
I: None.  
R: Really? Because of where you are?  
I: Yeah. I have to drive. If I want to go anywhere, I have to drive.  
Although there was no specific reference to commuting, the Volitional control<sub>(PBC)</sub> code was applied. Firstly, this exchange followed Ursula's assertion that she had no choice over how she commuted. Secondly, "anywhere" logically includes DMU.

### 6.5 Results

#### 6.5.1 Shared discourses used to explain commuting behaviour

As Fairclough (2003, 14f) notes, textual analysis is



inevitably selective... we choose to ask certain questions about social events and texts, and not other possible questions... the questions we ask necessarily arise from particular motivations which go beyond what is 'there' in the data.

In this study it would have been possible, for example, to focus on how people develop positions through talk, rather than reporting already-held views (Antaki, 1988). Although this issue is addressed, its explication was not the study's main aim. Rather, this was to explore how people explained their behaviour and to assess how far qualitative data would complement study 1's quantitative results.

The first stage of this process involved examining people's stated reasons for commuting (or not commuting) by particular modes and identifying shared positions, or discourses. Results of this exercise are reported thematically in section 6.5.1, with subsections detailing different discourses. Vocabularies and discourses evident in participants' accounts are summarised in *Table 6.6*.

Section 6.5.2 takes a more person-oriented perspective. Rather than treating discourses as units of analysis, it treats participants as such, examining how people constructed positions on commuting by invoking multiple discourses. In a sense, this is comparable to examining interactions between variables in a quantitative analysis.

#### 6.5.1.1 *The car as practical: 'To have my own wheels makes perfect sense'*

Colman (2001) defines attitudes as cognitive and/or affective responses to phenomena and Ajzen's (1991a, 200) TPB draws no distinction "between affective and evaluative responses to a behavior". Recent travel research, however, differentiates between affective and instrumental evaluations (see Chapter 3). Congruently, this study revealed separate vocabularies and discourses relating to these issues.

Every participant expressed some instrumental evaluations of travel modes, referring to (dis)benefits such as (in)convenience, (in)flexibility, (un)reliability and speed. Such evaluations are based on objects' functional properties and have been called 'cold', in contrast to 'hot' (or affective) evaluations of how objects make people feel rather than how they serve practical ends (Pham, 1996; 1998).

Echoing the positive instrumental evaluations of driving evident in many travel studies (see Chapter 3, section 3.3.1.1), several participants represented the car as the most practical means of commuting; the best tool – in functional terms – for the job.

Les (full-time academic in his 50s) provides an example. He said that his main concerns were convenience and flexibility and that his car got him from door to door quickly and allowed him to come and go from DMU as he pleased. He described his approach to commuting as “a very practical, efficiency-oriented way of doing things.”

Like Les, several others reported that driving minimised journey time. When asked why she had driven to DMU on the day of her interview, Monica (full-time administrator in her 30s) said that she lived 25 miles from Leicester and then continued as follows.

I: Um, obviously that makes taking the car a lot, er, more easy decision. Catching the train, I've actually got to drive to Northampton or Market Harborough and each of those is still half an hour journey. Well my full journey to work is only forty-five minutes on a good day.

R: Oh right.

I: So obviously the car is the most sensible option for me.=

R: =OK.

I: I also, I have to drive from the University... I often have to go and visit companies.

R: Ah.

I: And they're not necessarily, um, ((pause)) based in Leicester. So again, you know, without sort of going through the hassle of trying to hire a car, once I'm here to then go out and see [these] companies or whatever. To have my own wheels makes perfect sense.

Monica also discussed the possibility of commuting by bus, saying that “we're out of town, so it is difficult to rely on public transport... I think there's like three a day.”

These excerpts illustrate several explanations for Monica's car use. As well as saving time, driving her own car avoided the “hassle” (or inconvenience) of organising hire cars for trips during working hours. These benefits, plus the impracticality of commuting by bus, “obviously” made driving the most “sensible” (i.e. ‘rational’) commuting mode.

Georgina (part-time administrator in her 50s) also mentioned journey time repeatedly and identified it as her most important reason for commuting by car in the ranking task, where she associated a temporally-short journey with convenience.

R: Is it possible to put them in order of importance?

I: Yes. ((pause)) Time first. ((pause)) And convenience, as that's almost linked with time.

She also noted the car's flexibility and reliability.

I: I like the independence that the car gives you. Being able to go exactly where you want to go on most occasions. And when you want to go.

R: Yeah.

I: Um, ((pause)) without being delayed. To be sure you'll be on time.

Moreover, Georgina, like Monica, was negative about bus travel.

I: Um, ((pause)) it used to take me about an hour to get home as well, when I came by bus, 'cos you've got to walk to the centre of Leicester, then wait for a bus. And that used to be, again, affected by the schools. They got put out of their sequence and didn't arrive when they should.

Through these evaluations she built a case for commuting by car based largely on its instrumental benefits and the disbenefits of buses. She actually claimed to enjoy bus travel because she could "relax totally", but suggested that this affective advantage was less important than speed, convenience, reliability and flexibility. Hence she drove. Furthermore, although she stated that her health would benefit from taking a bus and walking some of the way to DMU, her negative evaluations of bus travel provided a rationale for driving despite the need for exercise.

Positive views of the convenience, flexibility, reliability and speed of car commuting formed a core set of evaluations, at least one of which was expressed by 14 participants. These terms were central to the practical vocabulary with which many people explained their driving to DMU. Denise (full-time academic in her 40s), for example, said the following.

I: I guess what's all kind of linked together is those... 'cos they're what makes me drive a car... things to do with how practical, convenient, time, that sort of thing.

She ranked "Convenience", "Practicality" and "Time" as equal first when listing influences on her commuting behaviour. "Environmental concerns", which were also a recurrent theme in her account, were fourth. Although Denise expressed guilt over driving because of such concerns, she also stressed the car's instrumental benefits.

I: Y'know, the fact that it saves me fifteen minutes at either end of the day, I think that's important. Whether I should is another matter. But I do.

Despite the self-critical "Whether I should is another matter", her stance was that driving's practical advantages outweighed any reservations about it.

Denise's ranking task was echoed by Beryl (full-time administrator in her 40s), who identified "Flexibility", "Time" and "Convenience" as her three most important reasons for commuting by car. Several other participants spoke positively about the flexibility of car use. Tina (part-time administrator in her 60s), for example, said the following.

I: I can go exactly where I want to. If I want to stop off at a shop on the way or something... the thinking that you go from A to B and that's your journey is not really how I live... I do sort of a bunch of things at the same time. I wouldn't just go from A to B necessarily... I'd do all sorts of other things. Making little sorts of detours and things, which I couldn't do on a bus.

Like several others, she compared driving with bus use; negative evaluations of which were often used to justify car commuting. Ian (full-time academic in his 60s) compared his journey time of an hour by car with a two-hour bus trip that was "just unacceptable".

Ian also spoke very positively about his car's reliability.

I: Um, my car is extremely reliable and I can only recall one occasion in thirty-two years working at DMU when I haven't had a car available to come in.

Similarly, Jacky (full-time administrator in her 30s) said "I know I can rely on my car" and, in keeping with the comparative aspect of this discourse, "if people knew public transport was good and they could rely on it, it would be used so much more."

While the most common positive evaluations of driving referred to convenience, flexibility, reliability and speed, some people did cite other instrumental benefits. Harry (full-time administrator in his 50s) and Nigel (full-time administrator in his 20s), for example, mentioned comfort, but this was not central to the car-as-practical discourse; it was not one of the main pillars of this stance.

To summarise, many people who talked about the car's instrumental functions represented it as the most practical means to an end. Fourteen of the 24 participants used positive evaluations of driving's convenience, flexibility, reliability and/or speed to explain their use of cars for commuting. Many compared driving favourably with public transport in these terms. Beyond these four evaluations, people also spoke of the comfort of driving but unlike, say, convenience, this was not central to any accounts.

#### 6.5.1.2 *The car as impractical: 'It's just much easier to walk or cycle'*

Although many instrumental evaluations of driving were positive, there was an opposing discourse in which the car was represented as impractical. Various reasons were given for this view, but they are unified insofar as they all cast driving as somehow instrumentally inferior to other modes.

Perhaps the strongest proponent of this position was Frances (full-time academic in her 30s), who reported that she used to drive to work in the car of a friend with whom she car shared. However, she said the following about car ownership.

I: I can drive a car. I've never wanted to buy a car. I've never wanted to get to the position of actually having to rely on a car. Having to go to work to pay for my car. I don't particularly think I could afford to run a car without sacrificing other things I like.

Far from bringing instrumental benefits, Frances claimed that driving entailed sacrifice. She reinforced this by saying "I don't think having a car is as convenient as people who use them regularly make out, because I don't think they get the whole thing of how many days a week you have to work to pay for it." Again, she implied that car ownership is a financial trap.

Alun (full-time postgraduate in his 20s) also gave the cost of car commuting as a reason for avoiding it, although rather than the expense of car ownership, he talked about the cost of parking at DMU. The excerpt below is from a section of his interview in which he explained his views on various commuting mode options.

I: Um, well public transport I don't consider because it's such a short distance now.

R: Yeah.

I: Um ((pause)) car, I wouldn't, it costs too much to park. Too much hassle trying to park. Um ((pause)) I dunno. It's just money and unnecessary expenditure. Um ((pause)) it's just much

easier to walk or cycle... From the point of view of ((chuckles)) dealing with the car at the end of the journey.

As well as the financial disadvantage of driving when free modes like walking and cycling were practicable, Alun asserted that parking was "too much hassle". His position was that commuting by non-car modes was more convenient than driving.

For slightly different reasons again, Sue (part-time administrator in her 30s) also explained that she saw driving as less convenient than cycling to work. In her case this was because cycling was "quicker by miles" than driving in rush hour. She said that "at another time of day this journey would take you twenty minutes and it's now taking forty-five" by car, while her bicycle commute was "twenty-five minutes tops".

Motorcyclists stressed this mode's ability to reduce journey time by cutting through traffic. Ernie (full-time member of non-administrative staff in his 40s) said that while comfort was an advantage of driving, this was relatively unimportant compared to commuting quickly. Motorcycling apparently outperformed the car in this regard.

I: Um, ((pause)) right, the bike tends to be quicker than the car... simply the fact you can get through traffic [quicker.]

Rick (full-time administrator in his 40s), another motorcyclist, made similar comments, as did Patricia (full-time postgraduate in her 20s), the third and final motorcyclist among the 24 participants. She reportedly alternated this mode with driving and cycling to DMU. Her position was that the car was only practical when "I'm lugging my laptop around and I can't take my laptop and all my other bits and pieces on my bike." When she did not have too much baggage, she preferred to cycle because "it saves me money on petrol" and because "You know it's gonna take you however long to get in and unless you have a puncture or anything you're not gonna be caught up in traffic."

These excerpts illustrate how some people characterised cars as less instrumentally beneficial than other commuting modes on the basis of journey time and financial cost. One further instrumental benefit associated with a non-car mode is slightly different. All six people who said that they cycled to DMU mentioned exercise as a reason for doing so (although this seemed more important to some cyclists than to others). While the benefits of exercise accrue over a longer period than the immediate advantage of a

quick journey on a given day, they are still personal, material gains and so can be seen as part of the discourse that cast non-car modes as more functional than driving.

By way of example, Patricia said “my bicycle, I use that for fitness. It’s a good way of keeping fit” and Alun asserted that “it always feels like really good exercise when you’re cycling even if it is just a short journey.” These participants presented exercise as a relatively important reason for cycling. Patricia listed it as the third (of six) influences on her modal choice in the ranking task, while for Alun it was equal second of seven. Others identified exercise as a welcome side-effect of cycling rather than a primary motivation. Sue, for example, said that exercise was “sort of nice, but just the added bonus really.” Nonetheless, it is notable that everyone who reported commuting by bicycle alluded to its health benefits; benefits that cars do not provide.

In summary, although not as prevalent as the car-as-practical discourse, there was an opposing discourse that characterised driving as less practical than other modes. The three bases for this stance were that non-car modes could be cheaper, quicker and healthier than driving.

#### 6.5.1.3 *Choice and necessity: ‘I have to drive’*

In a recent study, Bickerstaff & Walker (2002, 2175) examined “the reasonings that people deploy in explaining and rationalising their behaviour in relation to the collective environmental and health-risk problem of urban air quality”. They identify a discourse – used to deny responsibility for pollution – in which the speaker “was the victim of forces over which they had little or no control – a lack of personal volition that shielded the individual from blameworthiness” (Ibid., 2184). A similar discourse was discernible here. In one sense, it can be linked with the TPB’s perceived behavioural control (PBC) construct, in that people asserted a lack of control in explaining how they commuted. (Invariably this was presented as necessitating car use.)

However, one can also make an association with the positive instrumental evaluations of driving described in section 6.5.1.1. Statements like Ian’s – that “the only realistic option is the car” – call to mind Handy *et. al.*’s (2005) discussion of choice and necessity in relation to travel (see Chapter 3, section 3.3.2). When somebody says that they have to drive, this could mean ‘driving is more convenient than alternatives’, rather than ‘no alternatives exist’. Describing driving to work as a necessity may be another

way of saying that it is more practical than using any non-car mode. Practicality and control may not be separate issues, but different ways of presenting the same issue.

Be that as it may, several participants spoke of choice and necessity in explaining how they commuted and a driving-as-necessary discourse was evident.

Ursula's (full-time academic in her 40s) assertion that "I hate driving, but it's a necessity" provides an example. This statement – and others including "I have to drive. If I want to go anywhere, I have to drive" – left little room for debate about the requirement for car use. Why would Ursula voluntarily do something that she hated? On the continuum along which participants positioned themselves in terms of level of choice over commuting mode, Ursula was at the zero-choice extreme.

No other participant was quite so categorical, but many said that their modal choice was constrained. Jacky and Zoe (part-time postgraduate in her 40s) illustrate this. Jacky lived six miles from campus, Zoe almost 30 miles away. Both said that they had to commute by car for similar reasons, illustrated by their ranking tasks (*Table 6.5*).

Jacky	Zoe
1= children	1 Children!
1= time constraints	2 No viable public transport alternative (within reason)
3 know I can rely on my car to work	3 Time constraints
4 safe in my car	4 Need car for other journeys – means car is already available (pay twice)

*Table 6.5 Jacky and Zoe's ranking task results*

The need to take children to school or childcare *en route* to DMU was presented as a major limitation on modal choice. Jacky explained as follows.

I: Yep, the reason I come by car is I've got to run to a very tight schedule.

R: Mmm

I: Got to be here for half past eight. Um, childcare facilities don't open until eight o'clock.=

R: =Right.

I: So, I've got half an hour to get from Oadby in here.

Although both women listed "children" as their primary reason for driving to work, this can be interpreted as an expression of inability to use non-car modes. Reference to children invoked Jacky and Zoe's role as mothers; a role that society values. While



some people might see driving as socially undesirable (see section 6.5.1.7), it seems unlikely that many would think it worse than a mother neglecting her children's needs. Thus, reference to children can be seen as a device for justifying car use.

Other people claimed to have no control over modal choice for different reasons. Harry shifted responsibility for his car use onto his employer. He seems to illustrate how people actively try to understand a situation through talk (Antaki, 1988). When asked why he drove to work, he made seemingly contradictory statements. He began by discussing his employer's position on car use.

I: When I first got the job, I work in ISAS and staff in ISAS are expected to travel round the various sites of the University... and in order to retain hold of certain quality parking spaces, if you like, they said you must have a parking space... I happen to have lodgings within a reasonable distance of the University, but I have to use the car to travel to work because that's what they ask me to do.

However, Harry then said that he rarely visited other sites and when he did, he did not take his car because "they make me take a hire car." He also remarked that "basically, I don't need to use the car" except to "go via a slight L-shaped route" to buy milk for the office *en route* to DMU. He also recalled that when his car had been unavailable he had walked to work, which "wasn't too difficult... it's just a matter of go and do it."

Thus, unlike Jacky and Zoe, Harry did not suggest that commuting by non-car modes was so impractical as to be impossible. He claimed that driving was necessary because of his employer's requirements. However, this stance was contradicted by his answer when asked whether there were other influences on his commuting behaviour.

I: My doctor's told me I need to lose some weight, so I shall be getting a bicycle soon and be cycling... So er, that will change my way, er, how I travel... it's just purely my choice... I am not forced by anybody else to [change] what I do.

Here he asserted that his commuting mode was under his control and, given that he planned to cycle, driving seemed not to be necessary after all. While he initially positioned himself as subject to uncontrollable forces, this stance was later revised.

Kath (full-time academic in her 50s) also made some seemingly contradictory statements. She began with the following justification for commuting by car.

I: The bus service is, the alternative would be bus, um, if I came on Tuesdays and Saturdays.

R: Ah.

I: That would be possible. Mondays, Wednesdays, Thursdays and Fridays, there's no bus service.

Stating that "*the* alternative would be bus" (emphasis added) implied that her options were driving and this single non-car mode. As buses were rarely available, this led to the conclusion that she had to drive. Nonetheless, she then rejected cycling because "it's uphill" and car sharing because she "may want to finish a job and the other person, they've got to go home". These statements hinted that despite identifying bus as the only alternative to driving, she still felt the need to address other possibilities. This is congruent with the idea that she did have a choice over how to commute, but the impracticality of non-car modes led her to present this as a no-choice situation.

Kath also noted the flexibility and especially the convenience of driving, ranking this as the second most important influence on her commuting mode (after "Lack of public transport"). Indeed, convenience apparently outweighed some drawbacks of commuting by car.

I: [Parking charges?] I don't mind, because of the convenience for me.

Again, Kath's stance that she had little choice over commuting mode can be interpreted as characterisation of the car as the most practical mode for this purpose.

Besides Kath, several others explained their car use for commuting by citing the absence of alternatives. For example, Owen (part-time academic in his 60s) dismissed the possibility of using buses because he lived "outside of a regular route" and lamented the lack of park and ride service.

I: And another factor influencing it, yes I am, I hope, reasonably environmentally friendly. And it seemed to me if there was a park and ride, or had there been a park and ride, I certainly would have used that.

Owen hinted that context prevented him from acting on environmental concern. He also remarked that “I’m not a very good cyclist. Um, and I don’t necessarily run eleven miles a day.” Thus, he asserted that despite his reservations, he had to commute by car. Or, in keeping with the alternative interpretation, that driving was so much more practical than other modes that this was tantamount to having no option.

Ian, too, claimed that the absence of public transport left him no choice but to drive to DMU, saying “I have no alternative”, “the bus is impossible” and “If there was a rail service, that’s what I would use.” Each of these statements supported his assertion that “the only realistic option is the car”.

Carl (full-time administrator in his 30s) also used the driving-as-necessary discourse in citing barriers to switching commuting modes. Like Ursula, he voiced displeasure at commuting by car.

I: So, er, ((laughs)) the A6 is an absolute *nightmare* with people tailgating... So if I could get away with getting on the train every day, I certainly would.

He provided two reasons for driving to DMU despite this sentiment. Firstly, trains were characterised as unreliable. Carl wondered “Whether they’re gonna actually turn up.” Secondly, commuting by train was said to be a waste of money.

I: You’ve still gotta pay the road [tax.] OK, you’re saving on petrol, you’ve still gotta pay the insurance, still gotta pay the road tax. Now if you could get kind of a refund, like the government could... y’know, offset your road tax via your... season ticket on the train. It would be, I would definitely choose the train.

Carl did not claim that there were no alternatives to driving, but that they were instrumentally deficient. He illustrates the blurred boundary between being unable “to get away with” using non-car modes (i.e. having no choice but to use his car) and driving because it is much more practical than alternatives.

In considering choice and necessity, one must acknowledge the role of (perceived) context. Participants’ arguments that driving was necessary always referred to some contextual condition. (Even when personal capabilities were invoked – as when Owen said that he could not run long distances – there was a contextual aspect.) Carl spoke

about unreliable trains, Kath about infrequent buses, Ian and Ursula about the complete lack of public transport near their homes, and so on.

It is interesting to note the possible links between context, necessity (or choice), and the reported changes in some people's commuting behaviour between studies 1 and 2. As explained in section 6.4.1, half of the 24 participants had previously expressed intentions to reduce their commuter car use. Alun was one of these 'reducers' and he reported switching from driving to cycling or walking. He was quoted in section 6.5.1.2 as saying that his journey was "such a short distance *now*" (emphasis added). We might hypothesise that Alun's reduced commuting distance removed the (perceived) need to drive and opened up a choice of modes that were previously unavailable (or impractical). While the interviews did not address this issue directly, some participants' accounts suggested that changes in context (especially in commuting distance) may have increased perceived choice of commuting modes.

Rick, for example, stated in study 1 that he usually drove to work at one of two sites in different towns. He subsequently relocated to the campus closer to his home, describing this change as follows.

I: Yeah, so when I worked at Milton Keynes I drove 'cos it was quite a long way. ((pause)) Over 20 miles.

R: Right.

I: But here I cycle quite a lot 'cos it's nearer 10 [miles.] Not all the time 'cos if I've got stuff to carry then I'll drive or if I reckon the traffic's gonna be really bad I'll use the motorbike, but I cycle when I can. Just obviously 'cos I enjoy riding my push bike.

Thus, like Alun, Rick apparently found himself with a choice of (practicable) commuting modes when previously the car had seemed necessary. He seemingly took the opportunity afforded by a contextual change to act on his enjoyment of cycling. Similar observations apply to Wendy (part-time academic in her 30s), who switched from driving to cycling or walking between the two studies.

To summarise, 10 participants asserted that their commuting mode choice was in some way restricted and they all presented this as justification for driving. They used phrases including "I've got to", "the only way is to drive", "there isn't really any alternative" and "it's a necessity". Some people cited lack of public transport as necessitating car use,

others public transport's cost or slowness, the inflexibility of car sharing, or the need to meet non-work commitments alongside work travel. However, as Handy *et. al.* (Ibid.) point out, what is presented as necessity depends on how much effort people are willing to go to. Some or all of the participants who invoked the driving-as-necessary discourse may have been able to commute by non-car modes, but this would have resulted in reduced personal utility (e.g. longer journeys, less reliability, less flexibility). Thus, although there was a distinct discourse expressing a lack of choice, it is arguable that the underlying issue was just the same as in the discourse characterising driving as the most practical commuting mode.

It is also notable that three participants who had driven to DMU at the time of study 1 reported greater choice over their commuting mode by the time of study 2 because their commuting distances had been reduced. They, of course, did not invoke the driving-as-necessary discourse, but their accounts point to interesting links between (perceived) context and (perceived) choice and necessity.

#### 6.5.1.4 *Affective motives: 'I just enjoy it'*

As noted in Chapter 3, affect in the context of travel refers to “feelings evoked by travelling, such as stress, excitement, pleasure, boredom and control” (Anable & Gatersleben, 2005, 164). Reference to such feelings was common in the interviews. Bryan (full-time academic in his 50s), for example, gave the following explanation for bicycle commuting.

I: I just enjoy it. Fun, y'know? Riding my bike. That's really why I do it. Don't do it as much as I'd like really. ((pause)) It's a nice way to start the day. ((pause)) And to end the day. Um, y'know, if you're a bit stressed or whatever [it's nice] to get out in the open air and do a bit of exercise and just blast it out.

Alun was similarly enthusiastic about cycling, saying that the fact that he considered it to be fun “absolutely, definitely” played a part in his choosing to commute by this mode. Several others referred to “fun”. For Ernie, it was attached to motorcycling: “a car's just a means of getting from A to B... Bike's much more fun.” Rick made the same point, remarking that motorbikes are “great fun”, but cars are “just a mode of transport” and Patricia said “motorbike's much more fun 'cos you're more involved with the actual ride. Um, whereas in a car it's like you're detached from the world.”

These were the only participants who commuted by motorbike and it is interesting that they all talked about the “fun” of this mode. It is also notable that nobody described car commuting as ‘fun’. This particular affective evaluation was only given by cyclists and motorcyclists and constitutes a discourse shared among users of these modes alone.

Drivers did, however, give other positive affective evaluations of their mode. Jacky, for example, made the following comments about her journey to work.

I: I’ve got no one, another thing I find enjoyable while driving is there is nobody in the car with me. ((laughing)) Nobody asking me questions. Nobody arguing. It’s quiet... That’s probably the only time of the day when nobody can ask [me] questions or bother me. I like that. It’s nicer than being on a bus with loads of other people around.

This seems distinct from arousal, or simple ‘fun’. It suggests less visceral, more contemplative pleasure, provided by quiet time alone.

Other drivers offered different reasons for enjoying privacy in their cars, but the common theme was “personal space”. Kath, Nigel and Monica all used this term. Notably, of six drivers who identified privacy as an enjoyable aspect of car commuting, only two listed it as an influence on their modal choice in the ranking task. Beryl and Kath each identified six influences and placed privacy fourth and fifth in order of importance, respectively. Thus, although mentioned, privacy was not central to anyone’s explanation of their driving. It was a discourse unique to drivers, however. Nobody who used a non-car mode gave privacy as a reason for doing so.

People also reported enjoyment from exercising a skill. Beryl said that she liked the “precision” of driving and the “feeling that you’re doing it well” by being “in the right lane, stopping at the lights, indicating”, while Ernie made similar comments about motorcycling.

I: You go round a bend and you go ‘Yeah, that was right.’ That feels good... You missed the drain, you’ve coped with that, it’s been smooth, it’s been steady.

Although it was a minority concern, these two participants clearly referenced similar themes in constructing accounts of commuting. Pleasure in exercising a skill can, therefore, be identified as another shared affective discourse.

An affective issue that received more attention was stress. Nigel said that after commuting by bus he “arrived at work in a lot less stressed state” than after driving. Carl commented that “I find driving to work an absolute nightmare. I don’t enjoy it all. The road is full of nutters”. Alun – explaining why he preferred not to drive to DMU – made the following statement.

I: Urban traffic is always awful... I don't like people's ((pause)) attitude [in their cars,] the individuation and the hostility [that sort] of arises. Don't like that. That stresses me, to be honest.

All three participants characterised driving as stressful, yet two of them (Carl and Nigel) commuted by car most days. Carl explained this by claiming that he could not often commute by train because it was expensive and unreliable (i.e. driving was necessary because alternatives were impractical). Nigel attributed his driving to habit; an issue explored in section 6.5.1.8.

Not everybody represented commuting as stressful, however. Ernie spoke of “little back roads that you can take the motorbike and unwind”, suggesting that motorcycling was a way to relax after “a stressful day”. This echoes Bryan’s remarks about cycling enabling him to “blast it out” when “a bit stressed”.

These evaluations of travel as stressful or relaxing differ from ‘fun’, referring to less direct emotional responses. Pleasantness or unpleasantness results from stress or relaxation, rather than being direct, visceral experience. It is notable that those who characterised commuting as stressful were all drivers, while those who characterised it as relaxing all used non-car modes.

One further affective issue differs from those already described because it is linked to the moral motives described in section 6.5.1.5, below. Guilt over driving can be characterised as an emotion arising from moral beliefs; an emotion overtly expressed or implied by several participants.

Some actually used the word “guilt”. Owen remarked that “I, to some extent, feel that sort of guilt that I’ve, you know, still used the motor”, while Sue (part-time administrator in her 30s) said that driving to work gave her “the feeling of guilt that I’m the only one in the car.” Others suggested guilt without using the term itself. For example, Tina said

"I'm very aware that I'm not a good person, ecologically", while Denise claimed to feel "a bit uncomfortable about" commuting by car and also stated the following.

I: I think the fact I think about it and I'm worried about it and feel bad about it does say something about me as a person or sort of my belief systems. Um, 'cos it does stem out of concern for the environment... although I don't always do as many things as I might to help.

Similarly, Alun's use of "I must admit" before explaining that he sometimes got a lift to DMU suggested discomfort over commuting by car, even when he was taking advantage of a journey that was being made anyway. With 10 participants referring to similar feelings, driving-inspired guilt was the most common affective discourse.

In sum, participants often spoke of emotional aspects of commuting. The most common affective terms were "fun", "personal space", "stress" and "guilt". The first three of these (along with less common references to pleasure in exercising a skill) can be seen as solely affective evaluations, while "guilt" also has a moral aspect. These five types of evaluation can be seen as five affective discourses; stances based on emotional aspects of travel.

Drivers frequently identified "personal space" as a pleasurable aspect of car use. "Fun", by contrast, was associated with cycling and motorcycling rather than driving, perhaps because driving was often associated with "stress". Pleasure in exercising a skill was reported by a driver and a motorcyclist, while "guilt" was expressed only by drivers.

Although more than half the participants talked about affective aspects of commuting, these were rarely central in accounts. Affect usually played a supporting role, providing additional justification for travel mode choices that were attributed more to practical or moral motives.

#### **6.5.1.5 *Driving as morally problematic: 'We're all responsible'***

One moral aspect of travel – guilt over car use – has already been introduced, but two further moral concepts were evident in the interviews: obligation and responsibility. These echo NAT's personal norm (PN) and ascription of responsibility (AR) constructs. Unlike Schwartz (1977), however, participants did not distinguish obligation from responsibility. These concepts seemed to be interchangeable. Patricia, for example,



responded as follows when asked whether she felt responsible for environmental protection.

I: Yeah, um, yes I do... I sometimes think about why I care about, you know, if we have negative consequences on the environment and say, if I wasn't gonna have any children that have to face the consequences, why do I feel, why do I feel morally obliged to, to sort of, um, hold my actions in check? And I don't know. I, ((pause)) you just think it's the right thing to do.

She answered the question about responsibility by referring to obligation, suggesting that she did not need to differentiate these concepts to articulate her moral position. The central idea of this discourse – that car use is morally problematic – required participants to acknowledge a moral dimension to travel, but they apparently did not concern themselves with any more specific philosophical notion.

In formulating NAT, however, Schwartz (Ibid.) was concerned with precise definitions. He proposed “self-expectations for specific action in particular situations... experienced as feelings of moral obligation” as a component of PN (Ibid., 227). Patricia was actually the only participant to use the word “obligation”, but others implied such feelings. Sue, for example, remarked that she “shouldn't really” drive to work.

It was often hard to say whether participants were talking about obligation or responsibility, but several identified a moral aspect to their travel behaviour. Alun provides an example.

I: I would hope that my action sort of contributes to a broader, better whole.

R: In what sense?

I: Um, I suppose cycling, or walking, reducing your car use, there's always a carbon dioxide reductions which has widespread implications=

R: =Yeah, yeah.

I: Which I'm quite pleased about... If I can do my part to reduce it.

He seemed to assert a moral duty to contribute “to a broader, better whole”. Perhaps the “hope that my action contributes” is best characterised as self-expectation (PN), but the desire to “do my part” could constitute ascription of responsibility to oneself (AR).

It was more common for participants to use the terms “responsibility” or “responsible” than to mention ‘obligation’. For example, Jacky’s interview contained the following exchange.

R: Do you think that you actually should try and cut down your driving?

I: Yeah, because we’re all responsible for the condition of the atmosphere at the moment. Yeah. Um, and the thing is if we don’t try and fix it, what’s going to happen for the future?

Notably, the question asked about Jacky’s behaviour while her answer referred to “we”, not ‘I’. This was not a complete shift of responsibility onto a ‘they’, but served to share the responsibility. Carl used the same rhetorical device when answering this question.

Others did not attempt to spread the burden of responsibility, seeming to accept it fully. Sue, for example, said the following when asked how driving made her feel.

I: It makes me feel very responsible for the environment actually, because what type of world are we leaving to our grandchildren? This is, ((pause)) this will affect their world.

The moral discourse also referred to “environmental beliefs” or “environmental concern”; terms apparently encompassing the range of motives captured by NAT (personal responsibility, obligation and awareness of behaviour’s consequences) without differentiating between them. Denise spoke of “environmental concern” and Frances remarked that commuting by bicycle and train “matches a lot of the kind of... environmental kind of beliefs I have.” The implication of such language was that speakers valued the environment and saw it as deserving protection, even though they did not identify particular obligations or responsibilities. Nonetheless, they appeared to suggest that their commuting mode choices had some moral basis, invoking the same discourse as more specific moral terminology.

Frances’ “environmental kind of beliefs” warrant further comment in connection to the earlier treatment of choice, necessity and context (section 6.5.1.3). It has already been proposed that some participants’ choice of commuting modes may have been widened by reductions in their journey distance. Contextual change also seemed to influence Frances’ commuting behaviour, but in a different way.

She stated in study 1 that her forthcoming campus move prompted an intention to reduce car use. (At that time she reportedly drove to work in a car share.) In her interview, however, she explained that this intention had been based on driving less far, rather than less frequently.

R: You didn't actually intend to stop driving and change to another mode of transport when you left Scraftoft?

I: No. Not at that stage. I just knew I wasn't gonna be driving as far to [get to] the city.

Thus, Frances' intention to reduce car use apparently rested on anticipating a shorter drive to her new campus ("the city"). After the campus change occurred, however, her context changed again when her car share partner moved away.

I: She lived in Loughborough and I lived in Loughborough. Um, she's now moved to Leicester. I then had to make a decision about what I was going to do in relation to getting to work... Um, a few years ago my father retired and gave me his Brompton fold-away bike.=

R: =Oh right.

I: So, um, ((pause)) I thought fine, I've got a little bike that I can get on and off the train quite [easily.] Um, it matches a lot of the kind of ((pause)) environmental, um, ((pause)) environmental kind of beliefs I have.

Unlike Alun, Rick and Wendy, whose cases were described in section 6.5.1.3, Frances' contextual change did not seem to widen her choice of commuting modes. In fact an option disappeared when her colleague moved. But despite her decreased choice, Frances reported that a contextual change prompted her to reassess her travel to work and this led her to switch to a combination of modes that was consistent with her environmental stance. This calls to mind the idea that changes in travel behaviour – especially routine behaviours like commuting – may require contextual stimuli that prompt people to consider their actions (Fujii *et. al.*, 2001; Matthies *et. al.*, 2002).

In sum, 11 participants used moral vocabulary when discussing commuting. This vocabulary gave rise to the guilt discourse detailed in section 6.5.1.4 and also formed the basis for the driving-as-morally-problematic discourse that referenced obligation, responsibility and environmental concerns. Terms used to indicate responsibility and obligation included "should" and "shouldn't", as well as "responsible" and "responsibility", but only Patricia used the word "obliged". "Guilt" was mentioned more

frequently and was also suggested by assertions of feeling “bad” about driving and having to “admit” to it.

Some participants shifted responsibility for reducing car use from ‘I’ to ‘we’, spreading the burden more widely without actually denying responsibility for addressing transport-related problems. It was also notable that participants often did not differentiate between NAT constructs, using ‘responsibility’ and ‘obligation’ interchangeably, or referring to general environmental concern.

#### *6.5.1.6 Car use consequences: CO<sub>2</sub> as ‘Long-term problem’ or ‘Most innocent of substances’*

Although it was difficult to distinguish talk about responsibility from talk about obligation, participants clearly used a separate vocabulary when discussing driving’s consequences, echoing NAT’s awareness of consequences (AC) construct. People were asked for their views on the consequences of car use and several mentioned environmental damage. Emissions were a common theme, illustrated by Sue’s stated concern over “the CO<sub>2</sub> that it puts out” and Zoe’s expression of anxiety that despite local air-quality improvements, “there’s still CO<sub>2</sub> and that’s the long-term problem.” Jacky was less specific about the nature of emissions, saying that “there’s an awful lot of toxins and whatever else goes into the air because of cars... it’s bad”, but still identified pollution as a negative consequence of driving.

These participants expressed concern over emissions, but this was not true of everybody who spoke about pollution. There was some scepticism over whether cars damage the environment. Ian asserted that “carbon dioxide is the most innocent of substances that has been given an awfully bad press”. He was a chemist and argued that “the way in which some people pursue scientific careers, they latch on to a concept and develop it, um, as they create their reputation. And I believe carbon dioxide is a victim of that kind of idea.” He illustrates how a vocabulary can be used for multiple ends. While some people referred to emissions to explain their guilt over car use, Ian used similar language to justify driving and to argue that “there isn’t necessarily a need for people to reduce the amount that they drive”.

Les, who was also a chemist, expressed a different kind of scepticism. Rather than denying that CO<sub>2</sub> is harmful, he argued that emissions are falling and so there is no cause for concern.

I: Because certainly, there's a downward trend in motor fuel. Now motor fuel's hydrocarbon... It gets burned more and more efficiently these days. Um, there is less and less pollution. Therefore when you look at the automotive contribution to carbon dioxide, it is decreasing. We are using, gently, less... And yet, they say that the automotive contribution is increasing from cars. I think that possibly people are making different assumptions and coming at different kind of, um ((pause)) because one thing that is happening is that the efficiency of motor vehicles is increasing.

The apparent confusion over emissions levels was attributed to an anonymous "they" who would have people believe that driving is more harmful than it actually is.

Kath emphasised a different aspect of the debate, expressing doubts over the seriousness of anthropogenic emissions compared to those from non-anthropogenic sources.

I: I suppose one of the other things that I think about in terms of cars and fumes and so on... I feel that environmental effects of cars is not as great as, say, one eruption of a volcano.

R: Hmm, sure.

I: And so when you just, when you look at, compare that, I think ((pause)) I suppose small steps are important, but in the other hand, are they that important?

Whilst acknowledging that cars produce emissions, she argued that these are insignificant compared to those from natural sources. This served to justify her assertion that "the convenience of going places" warranted driving, even though she occasionally got "a conscience about it".

Emissions were the most commonly-cited consequence of driving, discussed by 13 participants. Another consequence raised by several people was the UK's increasing traffic volume and resultant congestion. Unlike pollution, however, participants characterised congestion as a problem for themselves rather than for society or the environment. Rick provides an example.

I: I hate being stuck in traffic.=

R: =Mmm

I: I used to work at Milton Keynes. You could get in and out of Milton Keynes really easily.

R: Right.

I: I used to be able to get from my house to my office in 35 minutes... Here, because it takes so much longer, when I get into work, I'm usually not in the best mood.

Often when people spoke of congestion, they suggested resignation to it. Jacky commented that "everybody needs to get to work. What can you do? We're all in the same boat." Harry said that "competition for road space from other people gets up your nose" but then asserted that if he asked others to drive less "it would be like calling, the pot calling the kettle black... I use the car because I like it and so does everybody else." Thus, congestion was usually represented as an unavoidable consequence of – in Tina's words – "the lives we lead".

Other consequences of car use that were identified as negatives included the need to build roads and the resource use necessitated by a car-oriented society. Beryl, for example, mentioned "waste of energy resources" and "the need for petroleum and digging for it". Driving was not always associated with negative consequences, however. A few participants suggested beneficial effects. Harry argued that "road transport keeps the country going, keeps the economy going" and Alun stated that "roads may be necessary... to make sure that everyone is included". Social inclusion was the most commonly-cited positive consequence of car use. Ursula said that driving "opens up so much to you. You know, I can get to places that I just couldn't without a car... that's a positive" and Jacky remarked that "it's freedom for people if they've got access to cars."

To summarise participants' talk about car use consequences, more than half spoke of emissions – many specifying CO<sub>2</sub> – and most of these said that such emissions were a negative. A few people, however, expressed scepticism about whether vehicle emissions really do cause environmental damage and/or whether this damage is accurately reported. Thus, the most common car use consequences discourse cast driving as environmentally harmful, but there was an opposing position.

Congestion was identified as a problem by several participants but they tended to accept this as inevitable, suggesting that nothing that could be done because

everybody needed to travel. Other negative consequences, such as resource use, were mentioned by very few people.

Although most comments on the consequences of car use cited negative impacts, some participants identified positives; that driving facilitates economic functioning and provides opportunity. These were, however, minority positions. The prevalent stance acknowledged few, if any, positive consequences of the current level of UK car use.

#### 6.5.1.7 Social pressure: *'It's my car and I will drive it'*

The TPB's subjective norm construct (SN) captures "the perception of the individual that, in general, other people who are important to him, want him to perform" a behaviour (Staats, 2003, 173). SN has been implicated in modal choice (e.g. Hunecke *et. al.*, 2001), although its influence is not always statistically significant in quantitative studies (e.g. Klöckner & Matthies, 2004). Thus, it has been suggested that researchers should expand conceptions of social influence to capture issues like status and "self-ascribed social role" (Bamberg & Schmidt, 2003, 280) (see Chapter 3, section 3.3.1.3).

Relatively few participants acknowledged social pressure surrounding commuting, even when pressed. For example, Georgina's interview included the following exchange.

R: Can you tell me if there are any ways in which other people influence how you travel?

I: Um, there's just myself and my husband at home... so no. For a while he was working in Leicester and I used to give him a lift in.

R: Right.

I: So that was useful... Um, ((pause)) and if he, we have two cars... So, if one of the cars wasn't available, the bus is always an option to me. Whereas it might not be, [it does vary where] he travels to. Um, and if he's in town he will come by bus. Unless I can bring him. Um, ((pause)) so, not really.

R: [Ah, OK.]

R: OK... that's very much kind of responsibilities to other people for transporting them around. How about kind of social pressure?

I: No.

R: You don't feel that that's an issue?

I: Hmm, no.

Fifteen participants responded to this question by reference to transporting others. Only nine people mentioned the possibility of social pressure surrounding travel, but did not necessarily cite it as an influence on their commuting behaviour.

Just two people explicitly acknowledged an anti-driving social norm. When Kath was asked if her travel behaviour was influenced by others, the following exchange ensued.

I: I'm sympathetic to people who don't want to use cars. Um, but I'm not necessarily influenced by them.

R: Can you elaborate?

I: Well because I, I, I do, I do think about energy saving and um, and particularly environmental aspects.=

R: =Sure.

I: You know, I'm sympathetic from that point of view. But not when it stops me, I mean there's the convenience of travel and the inconvenience of public travel. Which I, I think that public services have got to do a lot more before they, um, appeal to a large number of people.

She acknowledged that some people "don't want to use cars", seemingly assuming pro-environmental motives. However, despite expressing sympathy for this position, she invoked the car's practicality and its necessity due to poor public transport to justify her driving. Public transport would have to improve (something beyond her control) before it could match the car's instrumental benefits.

Vic (full-time academic in his 30s) also spoke of a perceived norm and claimed not to be influenced by it.

R: OK, are there any ways in which other people influence how you travel?

I: No... There is social pressure to not use the car so much, etcetera. I don't feel affected by it... I'm not influenced by what anyone thinks about me driving. It's my car and I will drive it.

This time, however, there was no recourse to necessity or the car's practicality when explaining why the norm was ignored. Vic simply asserted his right to drive.

Other participants did not mention anti-driving social norms explicitly, but hinted at awareness of them. For example, Tina initially described how her travel was influenced by others insofar as she would "pick a friend up to go and play bridge", but discussed



social pressure when prompted. She said "I know that I'm very, um, what's the word? Un-ecological really, because I drive everywhere... I'm very aware that I'm not a good person, ecologically." Her self-criticism suggested a perception that others (possibly including the researcher) would also be critical of her driving.

Denise remarked that "I'm not sure that, that I am particularly influenced... by other people's modes of transport, or what they want to do". She too seemed to acknowledge that others may prefer her not to drive, but asserted that this did not influence her actions. Interestingly, she was one of only two people (with Kath) who alluded to both injunctive and descriptive norms. The latter did not feature in any other accounts.

As well as six participants who explicitly mentioned or implied social pressure against car use, three identified pro-driving pressure. Nigel said "I suppose there's an expectation on you to have a car... and if you've got a car, use it", but did not specify who expected this. Sue identified her family as a source of pressure.

I: I think if I went on the bus, they'd say, 'Why are you going on the bus when you could have driven?'... They wouldn't understand if I'd gone to visit them by bus when I could have driven.

Nigel and Sue illustrate that social pressure is heterogeneous. There may be different norms, from different sources, around any issue. Which norms are salient for an individual will depend on the information they attend to, who they mix with and so on.

The third person to speak of pro-driving social pressure was Harry. It was reported in section 6.5.1.3 that he justified commuting by car by saying that his employer required it. The employer can be seen as an "important" other (Ajzen, 1991a; Staats, 2003), just like relatives or friends. Harry claimed that pressure from his employer to travel by car made it necessary, simultaneously invoking two discourses and suggesting that in organisational settings, employer pressure may influence commuting mode.

In summary, social pressure discourses were less prevalent than either necessity or practicality discourses, which echo the TPB's other predictive constructs. Most people did not indicate any perception of social pressure on how they commuted. Of those who did, only around half actually said explicitly that they believed that others had preferences in this regard. There was a split in this group, with two participants identifying anti-driving norms and three identifying pro-driving norms.

A small number of others implied that they perceived social pressure surrounding travel, but hardly anybody identified this as an influence on their commuting mode choice. The exception was Harry, who claimed to drive because of pressure from his employer. Thus, while social pressure discourses were invoked, participants usually positioned themselves as observers of this pressure rather than as acting on it. Moreover, looking beyond the specific conception of social pressure captured by the SN construct, references to status, prestige or beliefs about participants' own roles were conspicuous by their absence.

#### 6.5.1.8 *Habit: 'I made the decision twenty years ago and I just keep doing it'*

Schwartz's (1977) NAT does not account for habit as an influence on future actions. Ajzen (1991a), however, seems non-committal on whether habit's inclusion should increase the TPB's predictive power. He has argued that habits

capture the residues of past behavior that have established a habit or tendency to perform the behavior on future occasions. Attitudes are, of course, such residues of past experience, as are subjective norms and perceived self-efficacy

(Ibid., 203).

This suggests that the TPB accounts for habits. However, elsewhere Ajzen (2001, 48) notes that "the frequency with which a behavior has been performed in the past tends to correlate well with later actions" and "intentions may become largely irrelevant when a behaviour... has become habitual". This suggests that habit can influence future actions independently of intention and, by implication, its antecedents. Previous travel research shows that this is the case (see Chapter 3, section 3.3.3).

Two participants explicitly referenced habit in explaining their commuting behaviour. Nigel said that despite the stress of car use and convenience of the bus, his driving to DMU was "down to laziness and force of habit". Georgina stated "I suppose I've formed a habit of coming in the car."

Others did not use the word 'habit', but nonetheless suggested that their commuting behaviour was automatic. Jacky observed that "I have the same routine every day" and Tina, asked why she had driven on the day of her interview, said "I made the decision twenty years ago and I just keep doing it."

In most cases where habit featured in accounts, it was used to justify ignoring factors that might encourage behaviour change. Jacky and Nigel both expressed guilt over car use and identified negative environmental impacts, but attributed their continued driving, at least partially, to habit. Nigel was blunt about this. He compared various aspects of commuting by bus and car and the former was usually evaluated more favourably (less stressful, more convenient, less environmentally harmful). But despite this, he said that he drove to work automatically. When asked why he had first driven to DMU, the following exchange ensued.

I: I've always driven anyway.

R: Right.

I: Before I started working here... So, it's just been normal to drive into work. So, er, I mean I have used buses on a couple of occasions... Which was quite nice.

R: Right. So, I mean, given that ((pause)) why do you use the car in preference to the bus normally?

I: Um, ((pause)) I don't know really. I just ((pause)) I got the car back and I thought to myself, 'When I get the car back I might use the bus more'.=

R: =Hmm

I: But of course, I didn't.

The phrase "But of course, I didn't" suggested resignation to habitual driving. It implied that despite considering bus use, Nigel could not overcome his 'automatic behavioural response' (Aarts & Dijksterhuis, 2000). This echoed the driving-as-necessary discourse, which expressed low control over commuting behaviour. It could be argued that Nigel justified driving by implying that habit overrode his conscious will. He was not fully in control of his actions. It is also interesting that he initially explained his habit of driving to DMU by referring to having "always driven anyway". There was apparently no salient feature of driving by which he could explain his behaviour, perhaps indicating the extent to which it had become habitual.

To summarise, six participants suggested that their commuting behaviour was habitual. Habit was often used to justify driving despite imperatives to use other modes (e.g. their lesser environmental impact). One participant implied that habit was a force beyond his control, which may have prevented his intentions from influencing his behaviour.

#### 6.5.1.9 Laziness: *'Basically, I'm lazy, so...'*

Only two participants cited laziness as an influence on their commuting mode, but it warrants comment because it has apparently not been addressed in travel research.

Nigel, as reported above, attributed his driving to "laziness and force of habit".

Moreover, when asked whether his modal choice said anything about him as a person, he replied as follows.

I: I don't think driving says anything about me apart from maybe being a bit lazy. ((laughs))

Again, driving was associated with laziness. The fact that Nigel laughed after this statement suggested some unease about it. To call somebody – even oneself – "lazy" is pejorative. The negative connotation was softened by prefacing with "a bit", but the self-criticism remained.

Vic, by contrast, asserted laziness rather than admitting it.

R: Can you talk me through the thought process that led to you choosing to drive to work today?

I: I'm not on a bus route. ((pause)) I've bought a push bike but it's too big for me so I can't ride it.

R: ((chuckling)) Oh right.

I: And basically, I'm lazy, so, ((pause))

R: Right.

((laughing from participant's colleagues in background))

I: It's true!

Laziness was ranked as the second most important (of five) influences on Vic's commuting mode choice, after "No close or easy public transport". One can connect these influences and ask whether somebody less (self-professedly) lazy might characterise the same public transport as usable. Frances, for example, cycled three miles to a station, took a train and then cycled another mile to DMU. She said that cars "have their uses", but she had "tried to find other ways" to travel; expressing willingness to exert effort to avoid car use. Vic's stance was quite different. He freely admitted that "for most short journeys I'll take the car". This echoed his statement that "I'm not influenced by what anyone thinks about me driving. It's my car and I will drive it." He asserted indifference to others' wishes and his right to travel as he pleased.



#### 6.5.1.10 Summary of vocabularies and discourses

Section 6.5.1 has reported participants' explanations for commuting by particular modes, identifying shared vocabularies and discourses. Using King's (1998) template analysis method, all 24 interviews were coded five times and the template of codes was refined until all data relevant to commuting mode choice had codes attached to them. At the end of this process, eight shared vocabularies were evident. Five echoed constructs from Schwartz's (1977) NAT or Ajzen's (1991; 1991a) TPB. Some provided the basis for a single discourse, others for multiple discourses. *Table 6.6* summarises the vocabularies, discourses, how common these were and which commuting modes were used by people who invoked them. (The orange colour assigned to 'Driving as a source of guilt' is intended to show that this discourse has both affective and moral aspects, signified by yellow and red, respectively.)

Vocabulary	Discourse	<i>n</i> people invoking discourse	Mode(s) used by people invoking discourse
Travel modes' instrumental functions	The car as the most practical commuting mode	14	Car
	The car as impractical compared to other modes	8	Bicycle, get lift, motorbike, train, walk
Choice and necessity	Driving as necessary because of contextual constraints	10	Car
Affective aspects of travel	Travel as a source of fun	5	Bicycle, motorbike
	The car as a provider of personal space	6	Car
	Exercising a skill as a source of pleasure	2	Car, motorbike
	Driving as stressful and non-car modes as relaxing	9	Bicycle, car, motorbike, train, walk
Moral aspects of travel	Driving as a source of guilt	10	Bicycle, car, motorbike, walk
	Driving as morally problematic	11	Bicycle, car, motorbike, train, walk
Car use consequences	Emissions as problematic	9	Bicycle, car, motorbike, train, walk
	Scepticism over emissions' seriousness	4	Car, motorbike
	Congestion as inevitable	6	Car, motorbike
Social pressure	Acknowledgement of anti-driving social norm	6	Car
	Acknowledgement of pro-driving social norm	3	Bicycle, car
Habit	Driving through habit	6	Car
Laziness	Driving through laziness	2	Car

*Table 6.6* Vocabularies and discourses

Some discourses were especially prevalent. The most common presented the car as the most practical travel mode (using 'cold' instrumental evaluations captured by the ATT construct), particularly because of its convenience, flexibility, reliability and speed. These evaluations were often given as reasons for car commuting. Negative views of public transport were also common and were part of this same discourse.

A smaller number of participants used the same instrumental vocabulary to argue that driving was actually less practical than commuting by non-car modes. The three reasons provided for this were financial cost, journey time and the health benefits of self-powered modes (especially cycling).

Several people argued that their context in some way necessitated commuting by car. Links can be drawn between this discourse and the PBC construct (capturing perceived control over a behaviour), although statements of necessity or low control can also be interpreted as expressing the practicality of driving relative to other commuting modes. The vocabulary of choice and necessity was only used to argue that car use was unavoidable. There was no opposing discourse by which people expressed their choice of commuting modes. Perhaps those who enjoyed such choice saw no need to assert it, whereas others used lack of choice as a central premise in explaining their driving.

Almost half the participants used a moral vocabulary to characterise travel as moral behaviour and driving as morally problematic. Despite Schwartz's (1977) distinction between responsibilities (AR) and obligations (PN), people who invoked this discourse used these concepts interchangeably. This discourse also referred to guilt, with several people saying that driving inspired such feelings.

As well as its moral basis, guilt has an affective component and was one of five affective aspects of travel that were used to explain modal choice for commuting. The others were travel as a source of fun, the car as a provider of personal space, one's own skill as a source of pleasure and driving as more stressful than alternatives.

Several participants identified emissions as a negative consequence of driving (echoing NAT's AC construct), with a particular emphasis on CO<sub>2</sub>. Not all of these people said that concern over emissions actually influenced their behaviour, however. Moreover, some people expressed scepticism about whether vehicle emissions actually harm the environment. Various other negative consequences of driving were identified, but congestion was the only one that was raised by multiple participants. This was characterised as an inevitable consequence of car use.

Most participants did not mention social pressure (SN) surrounding car use. Of those who did, most identified the pressure as being anti-driving, although nobody admitted to being influenced by it.

A quarter of participants indicated that their commuting behaviour was habitual. Some used the words "habit" or "habitual", while others spoke of "routine" or "automatically" using a particular mode. Habit was often used to justify driving despite acknowledged imperatives for avoiding car use. In one case, there was an implication that habit was a force which the participant could not control.

Two participants explicitly attributed their car use for commuting to their own laziness. One seemed apologetic for this; the other asserted his right to travel as he pleased.

As explained in section 6.4.1, study 2 participants were chosen based on study 1 standardised regression residuals. People were assigned to groups according to whether NAT, the TPB, both or neither was a 'good fit' for their study 1 data (*Table 6.1*). The aim was to include people with a variety of motives for their commuting behaviour. Study 2 did not seek to (dis)confirm study 1's findings, so analysis did not explicitly ask whether people used particular discourses that might be expected on the basis of their 'good fit' categorisations. (For example, people stating intentions to reduce their car use who had relatively small standardised residuals from the NAT regression might be expected to express moral motives for not driving.) Rather, study 2's open-ended questions were designed to provide much more diverse data than those from study 1 and to complement that study by taking a quite different analytical approach to the same general question of why people commute by particular modes. A narrow confirmatory focus would not have made good use of the rich interview data, which showed that each participant used several discourses to explain their modal choice and that people did not fall easily into pre-defined categories. Combinations of discourses are explored in section 6.5.2, below.

In summary, participants often cited influences captured by NAT and the TPB in explaining their commuting behaviour. Although some interview questions were designed to tap these constructs, prompting people to talk in these terms, influences captured by NAT and TPB were often raised in response to questions that did not specifically reference them, suggesting that these ideas were salient for participants

and provided shared means of discussing commuting. There were also discourses relating to influences beyond these theories' purview. These were used in talking about affective aspects of travel, habitual driving and laziness.

### 6.5.2 *Constructing positions using multiple discourses*

While section 6.5.1 described vocabularies and discourses evident in people's accounts of commuting, it did not focus on participants as individuals. Each discourse expressed one broad idea about travel to work, but each person combined these ideas in different ways to present their own overall stance on commuting.

As might be expected when people talk freely and at length about a subject, each stance was unique. It was notable, however, that some combinations of discourses recurred. The most common are reported below. The following sub-sections do not cover all 24 participants, but selected individuals illustrate various ways in which people used multiple discourses to explain their commuting behaviour. Interestingly, these combinations of discourses are cross-theoretical; they show people invoking ideas from both NAT and the TPB, or combining concepts captured by one of the theories with other concepts, such as habit, that are not included in either model. *Table 6.7* shows what combination of discourses each participant used to explain their commuting mode choice. It also shows whether they moved campus, how far they commuted before and afterwards and what mode(s) they used during study 2. (Everyone commuted by car at least four days a week during study 1.)

#### 6.5.2.1 *Morality and self-interest as mutually-reinforcing*

One reason for using both NAT and the TPB in this research was that neither explicitly captures the possibility of people having moral and self-interested reasons for one action. While talk may not reveal 'inner realities', six people at least spoke of having mutually-reinforcing moral and non-moral motives for commuting by particular modes.

Ernie, for example, said that reducing his car use for commuting between studies 1 and 2 had benefited him and others. He reportedly gained financially from cutting his car use in favour of motorcycling because "bike's more economical". He also stated a desire to avoid "sitting in jams and churning out fumes and not going anywhere", which can be characterised as a pro-environmental (moral) position.



Participant	Campus move	Study 1 commute (miles)	Study 2 commute (miles)	Mode(s) during study 2	Combination of discourses invoked to explain commuting mode choice
Les	No	4.0	4.0	Drive	Car as practical and doubts over environmental impacts
Alun	Yes	6.4	1.5	Cycle/walk/get lift	Car as impractical, driving as morally problematic, affective motives for cycling and concern over environmental impacts all supporting use of non-car modes
Patricia	No	4.1	4.1	Cycle/drive/motorcycle	Car as impractical, driving as morally problematic and concern over environmental impacts all supporting use of non-car modes
Frances	Yes	22.7	15.1	Cycle and train	Car as impractical, driving as morally problematic and concern over environmental impacts all supporting use of non-car modes
Ernie	No	26.7	26.7	Drive/motorcycle	Car as impractical, driving as morally problematic, affective motives for motorcycling and concern over environmental impacts all supporting use of non-car modes
Rick	Yes	23.4	12.5	Cycle/drive/motorcycle	Car as impractical and affective motives for cycling both supporting use of non-car modes
Owen	No	5.6	5.6	Drive	Driving as morally problematic, concern over environmental impacts, but driving as necessary
Sue	Yes	5.0	2.0	Drive/cycle	Car as impractical, driving as morally problematic and concern over environmental impacts all supporting use of non-car modes
Denise	No	2.2	2.2	Drive	Driving as morally problematic, but car as practical
Monica	No	25.2	25.2	Drive	Car as practical and affective motives for driving
Wendy	Yes	6.3	1.2	Cycle/walk/drive	Car as impractical, driving as morally problematic and affective motives for cycling all supporting use of non-car modes
Nigel	No	7.9	7.9	Drive	Driving as morally problematic, affective motives for bus use and car as impractical, but laziness and habit as reasons for driving
Vic	No	2.1	2.1	Drive	Anti-driving social norm and negative environmental impacts acknowledged, but habit, laziness and car's practicality as reasons for driving
Beryl	No	1.8	1.8	Drive	Car as practical and affective motives for driving
Harry	No	2.1	2.1	Drive	Driving as necessary and social pressure (from employer) as reasons for driving
Zoe	Yes	33.6	28.5	Drive	Driving as necessary despite being morally problematic and having negative environmental impacts
Georgina	No	5.0	5.0	Drive	Car as practical and habit as reasons for driving
Jacky	Yes	7.1	4.2	Drive	Driving as necessary, practical and affectively beneficial despite being morally problematic
Ursula	No	15.2	15.2	Drive	Driving as necessary despite negative affect
Ian	No	18.9	18.9	Drive	Car as practical and doubts over environmental impacts
Kath	No	8.3	8.3	Drive	Driving as morally problematic, but doubts over environmental impacts as well as practical and affective motives for car use
Tina	No	6.3	6.3	Drive	Driving as morally problematic, but necessary, practical and habitual
Bryan	No	4.0	4.0	Drive/cycle/get lift	Driving sometimes necessary, but affective and practical benefits from cycling
Carl	No	10.9	10.9	Drive/train	Car as practical and necessary despite affective and moral motives for using non-car modes

Table 6.7 Participants' commuting distances, modes and use of combinations of discourses

Patricia also said that she had reduced the amount that she drove to DMU, reporting a switch to more cycling. She too stated moral and self-interested motives. She expressed obligation to avoid commuting by car with her assertion that “I certainly feel like I should use my bike if I can” and guilt over driving by saying “I used my car today... I wish I didn’t, but I did.” But she also identified instrumental benefits from cycling, saying that “it saves money”, “you’re not gonna be caught up in traffic” and “it’s a good way of keeping fit.” Her position, like Ernie’s, was that using a non-car mode for commuting made both moral and practical sense.

Alun, Wendy and Sue’s accounts echoed Ernie and Patricia’s insofar as they reported having acted on the intentions stated in study 1 because they believed that commuting by non-car modes (at least sometimes) was both practical and morally right. But Ernie and Patricia were alone in saying that they switched modes when not subject to contextual change. Alun, Wendy and Sue all relocated between the two studies and this shortened their commutes. (As reported in section 6.5.1.2, Frances also expressed mutually-reinforcing moral and practical motives for switching from driving to commuting by bicycle and train. These motives were not, however, given in explanation for the intention to reduce car use that she stated in study 1. That was apparently based solely on anticipating a shorter commute.)

Ernie and Patricia’s commuting distances did not change and it is notable that both expressed a combination of moral and personal-instrumental motives for switching to non-car modes for some journeys. There is an interesting comparison with Denise and Nigel. Neither moved campuses and both stated intentions to reduce their car use which were reportedly not enacted. They each expressed only one type of motive for avoiding driving (moral for Denise and instrumental for Nigel), while Ernie and Patricia expressed two types. Of those who moved between studies, people who invoked multiple discourses expressing different types of motive for reducing car use were more likely to report actually having done so than people expressing only one type of motive.

#### **6.5.2.2 *Morality and self-interest in opposition***

Moral and non-moral motives did not always sit comfortably together in people’s accounts. Six participants’ used the driving-as-morally-problematic discourse whilst also saying that commuting by car was either practical or necessary for them. This tension was best illustrated in Denise’s account and suggests a possible explanation

for her reported failure to reduce her car use, despite having stated an intention to do so in study 1.

Denise repeatedly expressed guilt over driving, saying, for example, "it's something I feel kind of a bit uncomfortable about" and "I don't feel totally comfortable with the car driving... for environmental and sort of ecological reasons." She also expressed obligation not to drive with her assertion that "I think I probably *shouldn't* be using a car" (her emphasis). However, she explained that "I choose to drive for practical considerations", arguing that commuting by car saved time and was convenient.

Whatever she intended during study 1, the stance taken in study 2 was that self-interest had prevailed over environmental concern. When asked how she usually commuted, Denise replied "I have been seriously considering giving up my car... But I haven't quite got there... so it's always the car."

Denise's positive evaluations of driving's practical benefits were not the only aspect of her account that conflicted with the moral concerns she reported. She also invoked the car-as-practical discourse when characterising non-car modes negatively.

I: I do not like cycling. I'm frankly scared of traffic... Wouldn't do that. Buses... by the time you've walked to the bus stop and waited for the bus, it's no better... So I see the choice as between having a car or walking.

Notably, the choice was between *having* a car and walking; not *using* a car and walking. This implied that simply owning a car was a barrier to switching commuting modes. Indeed, Denise proposed this (echoing Carl's comments in section 6.5.1.3).

I: I don't live that far from DMU... So, I mean, ((sighs)) I don't sort of feel terribly comfortable that I drive that distance. Partly, well the main reason I do it is because I own a car [and I] pay, y'know, the money that you pay out on your insurance and everything about owning car... So because I have got a car, I think I might as well use the car.=

The tension between Denise's moral stance and her (financial) self-interest was apparent again. While she expressed environmental concern and said that this made her feel guilty about driving and even to have considered getting rid of her car, her final position was that driving's practical benefits outweighed these considerations.

### 6.5.2.3 *Affective and instrumental motives as mutually-reinforcing*

Section 6.5.2.1 showed how evaluations of a travel mode's personal benefits could be consistent with a moral preference for that mode. Two mutually-reinforcing types of motive were expressed for the same behaviour. In a similar vein, eight participants presented their chosen commuting mode as bringing two types of personal benefit: instrumental and affective.

Monica, for example, identified practical and emotional benefits from driving. It was reported in section 6.5.1.1 that she gave several practical reasons to support her conclusion that "obviously the car is the most sensible option for me" (e.g. needing to drive during working hours, the infrequency of buses). But these instrumental evaluations do not constitute Monica's whole explanation for her car use. When asked whether she enjoyed driving, she made the following comments.

I: I do. I love it. [I have to] say... It's being able to be in my own environment and have the music on how I want the music on, um, ((pause)) I dunno, I just feel like you can enjoy, I like the journey... So, I just find, I do enjoy ((pause)) I, I can't quite put my finger on it. I think it's having your own personal space, really.

As well as being the most practical way of commuting, driving was characterised as an enjoyable experience because of the privacy it afforded. Two discourses that referred to different types of personal benefit were invoked to explain car use for commuting.

Other participants gave practical and affective reasons for commuting by different modes; particularly cycling. Alun said that enjoyment "absolutely, definitely" was a reason why he commuted this way and, as reported in section 6.5.1.2, stated that it was "just much easier to walk or cycle" to DMU than it was to drive and to park. Wendy's stated reasons for reducing her commuter car use in favour of cycling were similar, as were Rick's. He expressed considerable enthusiasm for cycling with statements including "I will try and favour my push bike whenever I can... That's just obviously because I enjoy riding my push bike" and "I really do like push bikes... I had a go on my wife's and just thought, 'Yeah, this is really good.'" But Rick also stressed that cycling was not just "a form of transport that's gonna get you from A to B. It's also gonna give you a physical workout." This is a practical benefit, although physical fitness (or the belief that one is physically fit) may also have secondary emotional benefits (e.g. Brehm, 2003; Edwards, Edwards and Basson, 2004). Thus, a number of participants

explained their commuting behaviour by saying that their preferred mode gave them both material and affective benefits.

#### 6.5.2.4 *Necessity overrides all else*

Another common stance – taken by seven participants – was that whatever they may have *liked* to do, they actually had to drive to work. The necessity for car use was often presented as a factor that negated any other concerns; moral, instrumental or affective.

Owen provides one example. As reported in section 6.5.1.3, he remarked that he thought of himself as being “reasonably environmentally friendly” and said that he would have preferred to use a park and ride service than to commute by car had such a service existed. He also said the following about his pro-environmental stance.

I: I try to save the planet by whatever means I can. I mean I've always tried to bring my children up to be environmentally friendly... I've done some environmental work, in terms of working with young people to raise awareness... So I feel I should, in some ways, be that classical youth worker who's still a role model.

This stated desire to be a role model apparently led Owen to “feel that sort of guilt that I've, you know, still used the motor” when he drove to work. However, he went on to assert that he had no alternative. When asked whether he always commuted by car, he replied as follows.

I: Yes. But if you look at, if you plot my feet, for me to get here by any other means, I've no idea how long it would [take.] But it would be, it would be pretty horrendous times. Just because I live outside of a regular route for buses and there's just no other way to get here.

Owen's position was that in spite of the guilt he felt because of driving and his concern for the environment, necessity overrode these motives and led him to commute by car anyway.

In contrast to Owen, Ursula expressed no pro-environmental beliefs or moral motives for avoiding car use, but still claimed that she would have preferred not to drive to work. Her explanation for this was affective. When asked whether she enjoyed driving, she replied “No... I don't like driving... I hate driving. It gets me really worked up... I hate it... I hate sitting in traffic jams. I hate driving. But it's a necessity.” She could

hardly have stated her negative emotional response to car commuting more forcefully, but argued that she had no choice because of contextual conditions (e.g. lack of public transport alternatives). According to Ursula, she had to drive whether she liked it or not; and she did not.

Harry claimed that he had to drive because his employer required him to retain a departmental parking space. What is particularly interesting about his account is that it illustrates the blurry distinction between choice and necessity and the way in which a behaviour can be presented as necessary or negotiable depending on the stance a person is trying to construct.

As reported in section 6.5.1.3, Harry initially claimed to have no control over how he commuted. Later, however, he stated that he intended to start cycling to work.

R: Is there anything else that influences how you travel, specifically for your work journey?

I: My doctor's told me I need to lose some weight, so I shall be getting a bicycle soon and be cycling... So er, that will change my way, er, how I travel... Because the doctor told me I've got diabetes, and I need to lose a stone in weight, so I shall be getting a bicycle and I shall be using that to get to work.

Harry clearly asserted modal *choice*, contradicting his previous assertion that "I have to use the car to travel to work because that's what they ask me to do." Thus, the necessity for driving disappeared from his stance. As such, it is arguable that although Harry said "I have to", we can interpret his expressions of employer pressure as a social norm that he apparently conformed to rather than a non-negotiable requirement. In his account, necessity did not override all else, despite his initial claim to this effect.

#### 6.5.2.5 *Habit overrides all else*

As noted in section 6.5.1.8, six participants suggested that their commuting behaviour was habitual. Some were explicit about this, while others implied habits by using terms such as "routine". What is most interesting as regards combinations of discourses is that some people talked of imperatives for using non-car modes but suggested that driving habits prevented these concerns from actually influencing their modal choice.

Nigel provides the best example. He spoke positively about his occasional experience of commuting by bus, characterising it as "quite relaxing", "convenient" and "less

stressful" than driving. In other words, he expressed practical and affective evaluations of bus use that were congruent with switching to this mode. However, he also said that each time he had commuted by bus because his car was unavailable, he had considered continuing to use the bus once his car was returned but had never actually done so: "But of course, I didn't." Habit was presented as a force acting against behaviour change even when – based on Nigel's own evaluations of bus travel – one might conclude that change would benefit him.

Tina's position is notable because she repeatedly expressed guilt – for example by saying that she was "not a good person, ecologically" and was "afraid" that she commuted by car – yet these evaluations of her behaviour as morally problematic did not lead to the conclusion that she should use another mode. When asked whether she consciously thought about how to get to work each day, she replied "No, I just get in the car" and, as reported in section 6.5.1.8, she said that she had decided to commute by car twenty years previously and just continued. She presented habit as a force that prevented her from *considering* alternatives to driving, whereas Nigel presented it as a force that prevented their *use*. Nonetheless, there is a similarity insofar as both of them characterised their driving habits as blocking behaviour change in some way.

#### 6.5.2.6 *Summary of positions based on multiple discourses*

The five preceding sub-sections describe some ways in which participants used multiple discourses to construct their overall positions on commuting. Although not exhaustive, they cover the most frequently-used combinations of discourses and illustrate how people dealt with apparently conflicting motives (e.g. the tension between morality and practicality in Denise's account) or provided several mutually-reinforcing motives for using a given commuting mode (e.g. Alun's argument that cycling was both more enjoyable and more practical than commuting by car and also that it accorded with his moral stance on driving). The theoretical implications of these findings are taken up in the discussion in section 6.6.

#### 6.5.3 *Additional analysis: the transtheoretical model of behaviour change*

Much of the above analysis refers to NAT and the TPB, but neither of these theories was designed to explain *behaviour change* over time (Huguenin, 2005). This is an interesting aspect of the present research; with seven participants reportedly switching commuting modes for at least some journeys to work between studies 1 and 2. One

framework with an explicit temporal dimension is Prochaska's (Prochaska & Norcross, 2001) transtheoretical model (TTM). This was developed to explain health behaviour changes like stopping smoking (Prochaska & DiClemente, 1982) and starting exercise (Nigg, Burbank, Padula, Dufrense, Rossi, Velicer, Laforce and Prochaska, 1999). It has been described as "a general explanatory model of intentional behavior change" (Ibid., 473). Despite this generality, the TTM has rarely been applied to environmentally-significant behaviour (ESB). A literature search revealed only one ESB study to use the theory; Gatersleben's (2003) investigation of cycle commuting.

According to the TTM, "people move through five stages when attempting to change a behaviour": precontemplation, contemplation, preparation, action and maintenance (Nigg *et. al.*, 1999, 473). They are summarised in *Table 6.8*, based on Prochaska & Norcross (2001). Although a simple interpretation of the TTM suggests that change is linear, practitioners note that people often cycle through stages and may never reach action or maintenance (Ibid.).

Stage of change	Theoretical definition	Operational definition
Precontemplation	There is "no intention to change the behavior in the foreseeable future". Indeed, the individual may not feel that their behaviour needs changing.	The individual is not intending to change the target behaviour in the next six months.
Contemplation	The individual is "aware that a problem exists and is seriously thinking about overcoming it but has not yet made a commitment to take action."	The individual is seriously considering changing the target behaviour in the next six months.
Preparation	"Individuals in this stage are intending to take action in the next month". They may have begun to make small changes, "but have not yet reached a criterion for effective action, such as abstinence from smoking".	The individual expresses a definite intention to change the target behaviour in the next month.
Action	"Individuals modify their behavior, experiences and environment to overcome their problems. Action requires considerable commitment of time and energy."	Individuals are in this stage "if they have successfully altered the dysfunctional behavior for a period from 1 day to 6 months."
Maintenance	The individual "works to consolidate the gains attained during action."	The individual is "able to remain free of the problem behavior and to consistently engage in a new behavior for more than 6 months."

*Table 6.8* TTM stages of change

The operational definitions in *Table 6.8* were used as decision rules to classify participants by stages of change. Each transcript was examined for references to switching commuting modes; either since study 1 or planned in the six months following the interview. Some suggested no previous modal switch or intention to



switch in future. For example, Ian simply replied "No, no" when asked whether he had considered reducing his car use. Expanding rather more, Les answered as follows.

I: Er, yes... But, er, actually we've tended to use the car more because at the time we were thinking about reducing the use of the car, um, some years back, the family started dispersing.

R: Right.

I: So we ended up with a, er, son in Wensleydale, North Yorkshire and daughter in um, in Norfolk... So, um, either way it was a hundred and fifty, hundred and seventy miles... plus my mother's now 90 and I go and see her once a week. And um, even if you get stuck on the M25 it's still quicker to drive than go by train.

This indicated precontemplation (although perhaps 'noncontemplation' would be better, as 'pre' implies that contemplation will occur later). Les said that he had considered reducing his car use "some years back", but there was no indication that he was contemplating doing so in the next six months, or that he had ever thought about reducing his commuter car use (despite the intention expressed in study 1).

Frances, by contrast, was apparently in the action stage. Having car shared "up 'til two weeks" before her interview, she reported having just started commuting by train and bicycle. Alun appeared to be in the maintenance stage. He said that he always drove to work at the time of study 1, but switched to cycling, walking or getting a lift after moving campuses nine months before study 2. He had therefore maintained his new commuting behaviour for more than the six months required to pass through the action stage. Harry, who said that he would "be getting a bicycle soon" and "using that to get to work" was classified as being in the contemplation stage. He suggested that he was seriously considering changing his commuting behaviour in the next six months. Each participant's TTM classification is shown in *Table 6.9*, along with the basis for it, and the intention stated in study 1. (It is stressed that classifications relied on self-reports.)

The TTM was applied to see whether participants at different stages invoked particular discourses in explaining their commuting behaviour. This was not an attempt to find discourses of precontemplation, preparation and so on. Rather, the aim was to see whether participants' use of discourses identified in section 6.5.1 was associated with their stage of change.

Intention	Participant	TTM stage	Explanation of TTM classification
Reduce car use	Les	Precontemplation	No talk of intention to switch commuting modes despite study 1 data
	Alun	Maintenance	Reported switch from driving to mix of non-car modes between studies
	Patricia	Maintenance	Reported switch to cycling more between studies
	Frances	Action	Reported switch to cycling and train two weeks before study 2
	Ernie	Maintenance	Reported switched to motorcycling more between studies
	Rick	Maintenance	Reported switch to cycling more between studies
	Owen	Precontemplation	Reported reducing car use by commuting less often due to semi-retirement, but talked of impossibility of modal switch
	Sue	Maintenance	Reported switch to cycling more between studies
	Denise	Contemplation	Reportedly continued driving despite intention stated in study 1
	Monica	Precontemplation	Reportedly reduced car use by commuting less far after house move between studies, but no talk of modal switch
Maintain car use	Wendy	Maintenance	Reported switch from driving to mix of non-car modes between studies
	Nigel	Precontemplation	Reported Only used bus occasionally and temporarily despite intention stated in study 1
	Vic	Precontemplation	Stated intention to continue driving due to laziness
	Beryl	Precontemplation	Stated intention to continue driving for convenience and enjoyment
	Harry	Preparation	Said he intended to start cycling "soon" for health reasons
	Zoe	Precontemplation	Said that she was unable to switch modes due to time constraints
	Georgina	Precontemplation	Stated intention to continue driving due to lack of alternatives
	Jacky	Precontemplation	Said that she was unable to switch modes due to time constraints
	Ursula	Precontemplation	Said that she was unable to switch modes despite dislike of driving
	Ian	Precontemplation	Said that he had never considered reducing his car use
	Kath	Precontemplation	Said that she was unable to switch modes due to lack of alternatives
	Tina	Precontemplation	Stated intention to continue driving due to lack of alternatives
	Bryan	Precontemplation	Said that he could not alter current mix of modes
	Carl	Contemplation	Stated that he was considering commuting by train more often

*Table 6.9 Participants' TTM classifications*

In fact, few such patterns emerged. Moreover, precontemplators did not commute much further than others. Average commute distance for precontemplators was 9.8 miles, compared to 9.1 miles for all participants (calculated using home and work postcodes at [www.multimap.com](http://www.multimap.com)). This contrasts with Gatersleben's (2003) finding that precontemplators commuted significantly further than others. However she only investigated switching from driving to cycling. Distance may be more salient when people think about switching to cycling than to bus, for example.

Three observations regarding the TTM are noteworthy. Firstly, nobody in the maintenance or action stages (seven people who switched commuting modes between studies 1 and 2) used the driving-as-necessary discourse. This suggests the importance of perceived control to behaviour change.

Secondly, the driving-as-necessary discourse was central in the accounts of eight of the 14 precontemplators. Again, this hints at the importance of perceived control to (even considering) behavioural change.

Thirdly, of six people who invoked the driving-as-morally-problematic discourse to express obligation to avoid car use for commuting, five (Alun, Denise, Frances, Patricia and Sue) were apparently beyond precontemplation. (The exception was Zoe, who apparently could not act on her personal norm because driving to work was necessary due to other commitments.) Of course, reports of reduced car use were not always associated with expression of normative self-expectations. Rick, for example, had seemingly reached maintenance and did not take any moral position on driving. In fact, he said “some people just like cars. Is there a problem with that? I don’t think it’s to be frowned upon. If someone wants to buy a car that only does eight miles to the gallon and they can afford it then that’s their choice.” The point remains, however, that where personal norms were expressed, they seemed to be associated with movement through the TTM.

## **6.6 Discussion**

This study set out to answer one broad question: how do participants explain their commuting behaviour? This question was addressed in two stages. Firstly, a number of discourses were identified in section 6.5.1. Secondly, ways in which participants combined these discourses to construct positions on commuting were reported in section 6.5.2.

In response to data concerning changes in some participants’ commuting behaviour, Prochaska’s (Prochaska & Norcross, 2001) transtheoretical model (TTM) was applied as a possible means of understanding the process of switching travel modes. Thus, as well as answering the original question, the study included some additional analysis.

### **6.6.1 *Vocabularies and discourses***

Section 6.5.1 examined explanations of commuting behaviour and treated discourses, rather than participants, as units of analysis. People gave a range of explanations for commuting by particular travel modes, from which eight shared vocabularies and 16 shared discourses were identified. Some echoed constructs from norm-activation

theory (NAT) and the theory of planned behaviour (TPB). Others referred to motives not captured by these theories.

Separate discourses echoed the TPB constructs of attitude (ATT), subjective norm (SN) and perceived behavioural control (PBC). Several people invoked the driving-as-necessary discourse (i.e. low PBC), absolving themselves of responsibility for their car use. Why should they do this? Perhaps they believed that driving would be disapproved of. Indeed, some participants alluded to an anti-driving social norm. Moreover, people may have perceived the researcher as being anti-driving. Although care was taken to remain neutral, participants knew that the researcher was from DMU's Institute of Energy and Sustainable Development. They may have assumed that such a person, investigating travel behaviour, would frown upon car use.

Whatever the reason, several drivers stressed that they had to commute by car, raising questions about choice and necessity. It was argued in section 6.5.1.3 that while participants used separate vocabularies to characterise driving as necessary or as more practical than alternatives, these were different ways of talking about the same issue. Some people said that they had a choice of commuting modes and chose the most instrumentally beneficial, while others positioned themselves as being unable to choose because non-car modes were so impractical. One might say that the former group *explained* their car use in instrumental terms, while the latter group *justified* it.

Kath, for example, said that she had to drive because there were no buses, her route was unsuitable for cycling and car sharing was inflexible. Tina gave similar reasons. Both also acknowledged anti-driving social norms and stated guilt over driving. Thus, while they expressed motives that would be consistent with avoiding car use, they justified driving by saying that it was necessary. These could be examples of self-serving bias, with people stressing the influence of external factors on behaviour that they feel is somehow deficient (for example, because it conflicts with a social norm) rather than admitting to internal motives (Hogg & Vaughan, 2002). Indeed, Steg (2005, 148f) suggests that "people might not be willing to admit that using a car fulfills many symbolic and affective functions" and that "car drivers are inclined to justify and rationalise their behaviour".

Kath, Tina and others highlight a point about contextual influences. The necessity of driving was attributed to numerous factors, which are divisible into two broad types: personal (or dispositional) and contextual (or situational). These categories have existed in social psychology for many years (e.g. Heider, 1958), but have been questioned. For example, Langdridge and Butt (2004, 360) argue that “this distinction is problematic because what we have traditionally defined as situational... may very easily be re-cast as dispositional and vice-versa”.

The personal/contextual distinction does seem simplistic. Vic, for example, identified laziness as a reason for driving to DMU, but also claimed that there was “No close or easy public transport”. The first reason referred to a personal characteristic, the second to context. But they must interact. Somebody else in the same situation may have said that public transport was usable (see Salomon & Mokhtarian, 1997). It is useful to recall Handy *et. al.*'s (2005) assertion that it may be impossible to differentiate actions taken through choice from those performed out of necessity because individuals have different perceptions of the effort that is acceptable (see Chapter 3, section 3.3.2).

Previous UK research shows that people often assert inability to drive less (DEFRA, 2002), or, put another way, that all their driving is necessary. The present study echoes this. Citing constraints such as having to combine commuting with family commitments (see Dowling, 2000; Root & Schintler, 1999) and the cost, quality or lack of public transport (see Exley & Christie, 2002), participants often used the driving-as-necessary discourse to justify car use despite imperatives to use other modes. It was invoked alongside statements of responsibility or obligation for avoiding driving, guilt over driving, or driving's environmental impacts. This echoes study 1's finding that PBC moderated AR/PN's influence on intentions. The different methods used in the two studies provide complementary results.

The driving-as-morally-problematic discourse provided another echo of study 1, in that participants seemed not to distinguish responsibility from obligation. This is congruent with the study 1 principal components analysis (PCA) where AR and PN loaded highly on one factor. There are other examples from travel psychology studies of responsibility and obligation being characterised as essentially the same. Bickerstaff & Walker (2002) offer qualitative evidence to this effect, while Hunecke *et. al.* (2001) provide quantitative evidence (see Chapter 3, section 3.3.1.4 and Chapter 4, section

4.5.3.2). These findings suggest that Schwartz's (1977) theoretical distinction between responsibility and obligation may not reflect how people talk about travel. Certainly the present study indicates that although some people describe modal choice as having a moral component, this component is undifferentiated.

In other ways, however, participants' accounts reflected Schwartz's (1977) formulation of NAT. He stated that failure to act on normative self-expectations (PN) causes "guilt, self-deprecation, loss of self-esteem or other negative self-evaluations" (Ibid., 231). Ten people expressed guilt over their car use. Whether they really felt this cannot be revealed by their accounts, but we should recognise the possibility that drivers did not want to seem 'uncaring' in light of anti-driving social norms. The fact that only seven of 10 people who expressed guilt over driving also expressed responsibility or obligation for avoiding it suggests that some of them may have asserted guilt for self-presentational reasons. Alternatively, expressions of guilt over driving could be seen as consistent with a lack of obligation to avoid car use when people also argue that driving is necessary (e.g. Kath and Tina). This is an issue for future research.

So far discussion has focused on NAT and TPB constructs that were each echoed by one discourse. People only referred to behavioural control when arguing that car use was necessary and, when discussing moral issues, participants invariably cast avoiding car use as 'right', whether they did so or not. Awareness of consequences (AC) was more contentious. There were two discourses that – although drawing on the same vocabulary of emissions, pollution and CO<sub>2</sub> – asserted opposing positions.

The more common discourse characterised vehicle emissions as environmentally harmful. Such statements were often used to explain feelings of responsibility and obligation, mirroring Schwartz's (Ibid.) proposal that PN is (partly) activated by AC.

But not everyone characterised pollution as a reason not to drive. Four participants expressed scepticism over the environmental harm caused by cars. Rick's stance was one of 'technological optimism' (Costanza, 2000). He argued that while cars do pollute, "emissions problems are going to be met by more efficient engines". Les expressed similar views. These shifts of responsibility for cutting automotive pollution onto industry reflect an almost identical discourse identified by Bickerstaff & Walker (2002). Ian asserted that emissions had never been a serious a problem and that the threat of

CO<sub>2</sub>-induced climate change was exaggerated. It is notable that he prefaced these remarks by saying "For the record, I am a chemist." This asserted his authority on the issue. Kath's stance differed slightly. She acknowledged that vehicle emissions could be damaging, but argued that anthropogenic emissions are insignificant compared to those from non-human sources, leading her to question the importance of human actions. While there were differences between these participants' positions, the common feature is that they all used scepticism about automotive-induced environmental problems to justify driving. (Although divided by whether they expressed concern or scepticism, it is notable that over half the participants talked about cars' environmental impacts. Whether this is representative of the UK population is doubtful. It may be a function of this sample's generally high education levels.)

In considering the opposing discourses on automotive pollution, it is useful to recall Hagman's (2003) proposal that people experience their cars' instrumental benefits, but only know about environmental damage through external sources. This knowledge is "negotiable, and open to interpretation" (Ibid., 8). Hence, Hagman argues, people feel able to justify driving on the basis of its personal benefits in the face of alleged environmental threats. The present study offers some support for this proposal. The benefits of commuting by car were always couched in terms of verifiable experience (using the car-as-practical discourse), while disbenefits were often cast in terms of less-perceptible environmental problems. (There was, of course, a car-as-impractical discourse as well, but this was less prevalent than the opposing position). The scepticism discourse illustrates that knowledge of such problems is negotiable and that at least some people feel able to challenge it when defending their driving.

As well as pollution, six participants alluded to another negative consequence of car use: congestion. Some cited this as a reason for commuting by bicycle or motorbike; modes that cut through traffic. Others indicated that congestion actually encouraged them to drive. Georgina explained as follows.

I: Er, and there are buses, which I could use. But when they stop ((pause)) [the traffic stops.] Um, because the road isn't wide enough. Um, ((pause)) it used to take me about an hour to get home as well, when I came on the bus, 'cos you've got to wait for a bus. And that used to be affected by congestion. They didn't arrive when they should've done. At least in the car I can nip off the main road and get around any spots where it's just not moving.

Thus, despite the paradox, there was a position which identified congestion as a reason for driving. This calls to mind the idea of travel as a social dilemma (see Chapter 3, section 3.5). Individuals might benefit from driving, but society suffers. Vic described this situation succinctly. His answer to whether he thought that problems caused by car use were important is reproduced below.

I: They're certainly important. But because they don't affect people in their day to day travel, or behaviour, ((pause)) um, people don't take them seriously or appreciate their consequences or really do anything to address them. I mean, I feel like why should I stop driving when nobody else is going to? Why should I put myself out?

Vic alluded to driving's negative consequences, but indicated that he felt no obligation to drive less because "nobody else is going to". The social dilemma highlighted by Vic reminds us that, as Schwartz (1977) proposed, awareness of consequences alone is unlikely to be sufficient motivation for altruistic behaviour.

A final note on car use consequences concerns the few statements of driving's economic and social benefits. Such views may help in understanding the UK's general car-dependence (see Chapter 7, section 7.3), but there was no clear, direct link with participants' commuting behaviour. These views may be related more to car ownership than to modal choice for specific journeys. Of course, some people cited car ownership to justify commuting by car, saying that it would be wasteful to pay for non-car modes while paying fixed costs associated with driving (see Salomon & Mokhtarian, 1997). However, nobody suggested a direct relationship between the car's general socio-economic benefits and their car commuting specifically.

As in Hagman's (2003) study, several participants explained their car use by reference to personal, practical benefits. Four of driving's instrumental advantages – convenience, flexibility, reliability and speed – constituted the prevalent practicality discourse. The comparative aspect of this discourse was important. People often gave negative evaluations of public transport alongside positive evaluations of driving. Participants may have given these negative evaluations to pre-emptively defend themselves against the charge that other modes could confer the same benefits as the car. Kath, for example, asserted (referring to driving) that "there's the convenience of travel and the inconvenience of public travel." Such perceptions are common in travel psychology research, leading Exley & Christie (2002, 19) to conclude that if "more



people are to switch to bus and train travel, major efforts will be needed both to improve services and to change the perception of public transport as inconvenient" (see also Chapter 3, section 3.3.1).

Although the most common practicality discourse supported driving, the car-as-impractical discourse referred to instrumental benefits to explain use of non-car modes. Cyclists and motorcyclists positively evaluated these modes' speed and ability to bypass congestion. Cyclists also referred to exercise. Despite conferring longer-term benefits than the convenience or flexibility of a given mode on a particular day, exercise can still be seen as instrumental. All six participants who cycled to work spoke positively about the health benefits provided by this mode, suggesting that – as Gatersleben (2003, 180) proposes – "those who cycle simply... like the exercise".

As discussed in Chapter 3, recent travel psychology studies have moved beyond the assumption that people only "make reasoned choices and behave rationally" (Steg, Vlek & Slotegraaf, 2001, 151), examining affective motives. The present study adds to this work. Although some people's explanations of their commuting behaviour were staunchly practical, more than half the participants gave non-instrumental reasons for using particular modes. Notably, however, these reasons were usually cast as supplementary; supporting morally- or practically-motivated choices.

There is some evidence of this finding being echoed in quantitative studies of modal choice (Anable & Gatersleben, 2005; Bamberg & Schmidt, 2003; see Chapter 3, section 3.3.1.2), but instrumental motives do not always appear to outweigh affective ones in this domain. Steg, Vlek & Slotegraaf (2001) found that motives' relative importance depended on the measurement method, while Steg (2005, 159) found that commuter "car use was especially related to symbolic and affective motives... not to instrumental ones" and that commuting mode was "not significantly related to the evaluation of the instrumental function of commuter car use."

Steg, Vlek & Slotegraaf (2001) also argue that people may not admit to enjoying driving if they believe it is socially undesirable. In the present study, no drivers described their mode as 'fun', whilst most cyclists and all motorcyclists did. This may be another example of self-serving bias and further research could examine whether social desirability might influence people's willingness to characterise driving as 'fun'.

Despite not mentioning 'fun', drivers provided other affective reasons for their modal choice. One that was unique to car users was pleasure from privacy. Based on a PCA of 33 evaluations of car use, Steg (2005) actually identified this as an instrumental benefit, but the way in which the present participants discussed it suggested that it was – as Ellaway *et. al.* (2003) argue – an affective evaluation. Jacky provides an example.

I: Yeah, and I've got no one, another thing I find enjoyable while driving is there is nobody in the car with me. ((laughing)) Nobody asking me questions. Nobody arguing. It's quiet.

R: A little moment of peace.

I: Yeah... I can gather my thoughts and um, ((pause))... That's probably the only time of the day when nobody can ask [me] questions or bother me. I like that. It's nicer than being on a bus with loads of other people around.

This implied a less visceral form of pleasure than 'fun'; pleasure from peace rather than excitement. Although commuting by car seemed unable to match other modes in terms of 'fun', participants suggested that it outperformed alternatives in providing 'personal space' (see also Hagman, 2003; Handy *et. al.*, 2005).

Ernie cited another aspect of affect, speaking of "little back roads that you can take the motorbike and unwind". Commuting offered time to relax after "a stressful day". This raises the idea of commuting as a buffer between work and home life (Salomon & Mokhtarian, 1997; Schwanen and Dijst, 2002). While rational-choice models assume that travel modes' attractiveness is "a function of travel time and cost" (Rodríguez & Joo, 2004, 152), people may not wish to minimise this time if they use it to "unwind".

There was a clear pattern whereby drivers represented commuting as stressful while others – especially cyclists and motorcyclists – represented it as relaxing. This echoes Evans, Wener and Phillips' (2002) idea that commuter stress results from journeys' unpredictability. Given that bicycles and motorbikes enable users to bypass congestion, they may increase predictability. As Patricia said, "You know it's gonna take you however long to get in by bike... you're not gonna be caught up in traffic."

Two people reported enjoyment of exercising skill when commuting (Beryl concerning driving and Ernie concerning motorcycling); something that has apparently not been investigated in previous studies. Pleasure in one's abilities calls to mind Bandura's (1994, 71) concept of self-efficacy: "people's beliefs about their capabilities to produce

designated levels of performance". As well as referring to normative self-expectations (PN), some participants explained their commuting mode choices on the basis of ability to meet other self-set standards.

In total, participants gave five types of affective evaluation. Apart from privacy and guilt, which only drivers alluded to, they were all raised by users of different modes, supporting the common-sense notion that different people enjoy different activities for different reasons. In a sense, this does not help policy-makers. There appears to be no one mode that people could be convinced is more enjoyable than others. Nonetheless, it reminds us that people do not choose travel modes for instrumental reasons alone.

As well as those concerning affective aspects of travel, participants used two other shared discourses that did not echo NAT or TPB constructs; driving through laziness and through habit. Laziness is another socially-undesirable motive whose expression may be influenced by self-serving bias. Accordingly, Nigel seemed uncomfortable when offering it as a reason for driving. But Vic was more self-assured. Perhaps this was a rhetorical challenge to the interviewer. By asserting that he saw laziness as a valid reason for driving, Vic defended his stance from possible criticism.

Although few participants explicitly mentioned laziness, some who did not still indicated that they preferred to minimise the effort expended on commuting. Beryl, for example, said that although she would have liked to, she often felt too tired to walk home, so she commuted by car. Whether this is laziness in the same sense as that expressed by Nigel and Vic is debatable. Perhaps the difference is in how the desire to minimise effort is presented. While Nigel and Vic used a socially-undesirable term, others preferred to rationalise their attempts to make commuting less demanding by talking about the car's convenience rather than any characteristic of their own. Just as driving-as-necessary may be another way of saying that driving is far more practical than other modes, perhaps laziness can be seen as another way of saying that one prefers to minimise effort.

Nigel and Vic's use of both habit and laziness discourses echoes observations made by psychologists in the attitude-behaviour tradition. Driving habits may develop more easily and be harder to break when drivers are unwilling to try other modes; when doing so is perceived as too much effort (Matthies *et. al.*, 2002). Nigel also illustrated

the idea that the intention-action relationship is weak when the intention is to change a habitual behaviour (Ajzen, 2001; Staats, 2003). He stated an intention to reduce his car use for commuting in study 1, but in study 2 he presented his driving habit as the reason why he had not acted on it. This supports other travel research suggesting that the intention-behaviour link is stronger when there is no habitual past behaviour (e.g. car commuting) that conflicts with intended future behaviour (e.g. commuting by non-car modes) (Bamberg & Schmidt, 2003; Bergström & Magnusson, 2003).

Tina also said that she habitually drove to work. She did not cast habit as a barrier to acting on intentions, but rather as an influence that stopped other motives from directing her commuting behaviour. She repeatedly expressed guilt over car use, but said that she had not considered driving less. Habit's role as a moderator of moral motives' influence on travel behaviour was discussed in Chapter 3, section 3.3.3, and Tina's account called to mind this effect.

To summarise, there were eight shared vocabularies on which participants drew to explain their commuting behaviour. Five echoed constructs from NAT or the TPB (moral aspects of travel, car use consequences, choice and necessity, travel modes' instrumental functions and social pressure), while three were beyond these theories' scope (affective aspects of travel, habit and laziness).

Some vocabularies gave rise to one discourse. When people spoke of choice and necessity, they invariably positioned themselves as having to drive. When speaking of moral issues, they always characterised driving as morally problematic. Only drivers described their commuting behaviour as habitual, or referred to laziness in explaining their modal choice.

Other vocabularies gave rise to multiple discourses, some of which were directly opposed to each other. These referred to anti-driving versus pro-driving social norms, concern versus scepticism about cars' environmental impacts and the practicality of driving versus alternatives. The final vocabulary – concerning affect – was the basis of multiple discourses referencing different aspects of travel, but these were not oppositional. Rather, they cited different types of non-instrumental evaluation (e.g. privacy, stress) as reasons for choosing particular modes.

Although other explanations for modal choice were offered, these were not shared amongst participants like the vocabularies and associated discourses described above. These were the most common stances on commuting in this study and can be seen as the prevalent ideas surrounding travel to work among participants.

#### 6.6.2 *The transtheoretical model of behaviour change*

Prochaska's TTM (Prochaska & Norcross, 2001) was applied to see whether different stages of change were associated with particular discourses. Gatersleben (2003), who applied the TTM to car and bicycle commuters, found that attitudes to cycling became more favourable and perceptions of personal barriers (e.g. fitness) became less apparent as people moved from precontemplation towards maintenance. She found no significant differences in perceptions of external barriers to cycling (e.g. weather) between people at different stages.

In the present study it was harder to see differences between people at different stages. Without statistical tests, there was no way to 'objectively' identify similarities and differences between participants. Furthermore, while Gatersleben (*ibid.*) examined differences on three variables (attitudes, personal barriers and external barriers), participants in this study cited 67 separate influences on modal choice for commuting (see Appendix 5). So many 'variables' made it difficult to identify patterns.

Nonetheless, three points can be made. Firstly, nobody in the maintenance or action stages said that they had no choice over how to commute and, secondly, those who said that they were not considering switching modes spoke of more barriers than other participants. Both of these observations highlight the relationship between perceived control and switching (or even considering switching) commuting modes in participants' accounts.

Gatersleben (*ibid.*) found that precontemplators did not differ significantly from actors or maintainers in their perception of external barriers to cycling, while they did differ in perceptions of personal barriers (e.g. needing a car for work). Beliefs about what cycling would be like seemed less off-putting to non-cyclists than beliefs about how it might constrain other activities. It is difficult to draw comparisons with the present study because drivers were not asked specifically what stopped them from cycling. However, it is notable that precontemplators identified numerous barriers to switching modes;

some personal and some external (using Gatersleben's distinction). These included weather, poor cycle lanes (external), needing the car for work, baggage and needing to combine commuting with other trips (personal) (see also Chapter 3, section 3.3.2.1). Such concerns were widely reported by drivers and there was no one barrier that stood out as especially common. As Gatersleben (*Ibid.*) suggests, efforts to reduce car use may need to be personalised. Addressing what is a barrier for one person may make no difference to others, although as discussed in Chapter 3, section 3.6, targeted interventions may have little impact on overall traffic levels.

The third observation regarding the TTM is that use of the driving-as-morally-problematic discourse was closely associated with talk of behaviour change. The relationship did not always hold (Zoe expressed moral concerns over driving but reportedly saw no alternative), but there was a general pattern. Where people apparently do see a moral dimension to travel, encouraging feelings of responsibility and obligation may prompt them to move towards switching modes. Unfortunately, the TTM does not reveal why some people characterise travel as moral behaviour when others do not. This remains a key question for future studies.

Use of the TTM in this study raises issues relevant to its wider application to ESB. Firstly, the theory was designed to illuminate changes in behaviours like smoking. Although people smoke different amounts, there is a clear line between smoking and not smoking. Travel behaviour seems less clear-cut. Participants reported commuting by different modes on different days. As Ernie said, "it's not an all or nothing deal." Changes in commuting behaviour may be incremental. Indeed, only Alun reported stopping driving to work altogether between studies 1 and 2. This seems to contrast with behaviours like smoking, where people generally stop instantaneously and are only 'successful' if they avoid relapsing (Prochaska & Norcross, 2001).

Secondly, the TTM does not account for past events. The operational definition of precontemplation (*Ibid.*), for example, refers only to what people may do in the next six months. This may be appropriate in contexts for which the TTM was designed, but past experience seems relevant to travel behaviour, as Nigel illustrates. He reported that he had commuted by bus and although he enjoyed it and found it convenient, he always resumed his car use. His classification as a precontemplator draws no distinction

between him and others without experience of alternative modes and it is this experience that makes his talk of habitual driving especially interesting.

Thirdly, the TTM was developed for situations where behaviour change could be seen as unambiguously desirable. For example, smokers probably accept this behaviour's detrimental health effects. Such behaviours are "dysfunctional" (Ibid., 444), but travel seems different. Vic, for example, said that driving is "just something that happens... a practical means to an end." Furthermore, the TTM was designed to explain "intentional behavior change" (Nigg *et. al.*, 1999, 473). In the present study, people often spoke of contextual changes that were beyond their control. Although they also reported personal motives for reducing their car use, opportunities to act on these motives were often said to arise externally (from, for example, DMU's campus reorganisation) and reduced car use sometimes seemed to require less effort than its maintenance (e.g. Alun and Wendy). In such situations, people apparently did not have to work "to consolidate the gains attained during action" (Prochaska & Norcross, 2001, 444).

How these issues might affect the TTM's applicability to travel or other ESBs is unclear. It is difficult to draw general conclusions when so few studies have used the model. It is potentially useful to identify issues that are salient at different stages of behaviour change, but more work is needed to see whether the TTM provides a suitable means of achieving this in behavioural domains outside that for which it was developed.

## **6.7 Conclusions**

This study's most important conclusions concern choice, necessity and the extent to which people said that they had to drive to work. Such claims reflect widespread views about travel in the UK (e.g. DEFRA, 2002). Of course, people react differently to the same contextual conditions, meaning that what necessitates car use in one person's eyes may not in another's. Moreover, people may attribute their driving to necessity rather than preference for self-presentational reasons. Nonetheless, policies making non-car modes more practical (i.e. convenient, flexible, etc.) may discourage people from arguing that they must drive if they make these arguments less convincing.

Improving non-car modes' practicality might also encourage people to act on anti-driving social norms. While some participants acknowledged such norms, they seemingly felt justified in citing cars' superior practicality and the difficulty of using

alternatives as reasons for ignoring them. SN's reported lack of influence on commuting behaviour may also be related to contradictory social signals. While some people acknowledged anti-driving norms, others identified pro-driving norms. Old and new ideas about the propriety of driving may be vying for acceptance, meaning that there is no dominant norm surrounding car use in this research setting (see Castro and Lima, 2001).

Similarly, participants did not express universal acceptance of environmental imperatives for avoiding car use. While there was some agreement that car use causes environmental damage – making driving a behaviour with moral implications – there was also an opposing position; that cars' negative environmental impacts have been exaggerated and that there is actually no need for behavioural change.

Indeed, there seemed to be two types of commuter; those who characterised travel as moral behaviour and those who did not. When efforts are made to encourage drivers to switch modes, appeals to responsibility and obligation may not engage the latter group. Moreover, while there was an association between presenting travel as a moral issue and talking about reducing one's driving, some participants maintained that car use was necessary regardless of moral concerns. This further underlines the apparent importance of perceived control, or choice.

People expressed low control for several reasons, but the most important seemed to be journey distance and lack of public transport when journeys were perceived as too long to walk or cycle. Because of DMU's campus reorganisation, some people had shorter commutes during study 2 than study 1. Some said that this increased their choice over how to commute, enabling them to act on their motives for reducing car use. In attitude-behaviour terms, perceived control seemed to moderate the influence of moral, instrumental and affective motives on modal choice.

These theoretical insights resulted from studying NAT and the TPB together and these theories captured many reasons that participants gave for their travel mode choices. This is notable, given that the interviews allowed people to discuss any influences. But people also offered explanations for choosing particular modes that are beyond NAT and the TPB's purview; most notably, affect and habit.



Analysis showed that affect is not indivisible. People offered various non-instrumental reasons for choosing particular travel modes. These ranged from 'fun' to enjoyment of exercising a skill. Notably, drivers did not characterise commuting as 'fun' (perhaps related to the view that it is stressful), while users of other modes did use this term to describe their journeys. Although what people enjoy is a matter of personal preference, it may be possible for policy-makers to use the 'fun' of non-car modes as a lever to encourage people out of their cars. On the other hand, they may struggle to convince drivers to relinquish their privacy. This study suggests that this is one non-instrumental evaluation on which alternative modes have difficulty competing.

Some participants spoke of habitual driving. In their accounts, attitudes to car use, beliefs about its impacts and so on seemed to underpin habits rather being presented as direct influences on commuting behaviour. If this interpretation reflects the cognitive mechanisms underlying travel behaviour, there are policy implications. Addressing attitudes and beliefs may be insufficient to change habitual driving. Additional measures may be required to encourage people to consider their travel on a daily basis rather than automatically using their cars (see Chapter 3, section 3.3.3).

Considering policy, it is interesting to recall Labour Deputy Prime Minister John Prescott's words when his party took power in 1997: "I will have failed in five years time if there are not many more people using public transport and far fewer journeys by car" (Wainwright, 2004, 14). UK car use actually rose, bus use fell and train use remained static in between 1997 and 2002 (Exley & Christie, 2002). Policy makers have much to do to persuade drivers to switch modes.

What policies does the study suggest? Firstly, even people who expressed anti-driving personal norms said that the fixed costs of car ownership incentivised driving. These costs are payable whether the car is used or not, implying that reported plans for 'pay-as-you-drive' taxation (Tempest, 2005) could help to cut car use.

Secondly, in contrast to Steg's (2005) Dutch study, participants identified instrumental motives for commuting by car. This may reflect the state of UK public transport compared to that in The Netherlands. Indeed, Exley & Christie (2002, 1) claim that the UK is "among the worst off countries in Europe for the quality of public transport." This implies a need for improvements in many aspects of non-car modes. Participants

suggested that they must be more accessible, quicker, cheaper, more reliable, more flexible and safer. There is nothing new here and many arms of UK government claim to be addressing such issues (e.g. LCC, 2005). However, the study also highlighted motives for car use that may be more difficult to influence. Some participants claimed to drive simply out of laziness. It is unclear what policies could change this.

Some drivers identified the need to carry baggage as a reason for car use and, again, it is hard to see how government could address this. Perhaps employers have a role. They may not be able to change the perception that baggage necessitates driving, but could perhaps reduce the carrying that people need to do for their jobs. Organisations could also consider reducing the need to drive during working hours, or, if this is impossible, providing car pools so that employees would not need their own vehicles. There could even be benefits from more relaxed dress codes, so that people would not be put off cycling by the need to wear smart clothes. These are issues of organisational culture, rather than transport policy *per se*.

Finally, the study revealed some scepticism about the harm caused by vehicle emissions. It is not clear from a small sample how widespread these views are, but the issue deserves attention. If many people are doubtful about the environmental harm resulting from car use, ways must be found to change this perception. Of course, care needs to be taken that educational efforts do not cause reactance. As Exley & Christie (2002) suggest, UK drivers seem to need few extra incentives to maintain their car use.



# **Chapter 7**

## **General discussion**

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### **7.1 Introduction**

Previous chapters have reviewed research on travel and other environmentally-significant behaviours (ESBs) and reported empirical work undertaken for this thesis. This chapter combines these strands, discussing issues arising from the thesis as a whole. It begins with a reminder of the rationale for the project and its epistemology in section 7.2. Section 7.3 discusses the project's implications for the type of 'synthetic theory of ESB' that Stern (2000) has called for; at least insofar as such a theory might be applied to travel behaviour. Following this, section 7.4 considers how travel psychology based on attitude-behaviour theories might benefit from incorporating ideas from other areas of psychology and the social sciences. Finally, section 7.5 discusses the thesis' relevance for travel and transport policy.

### **7.2 Rationale for the research**

This research was conducted in response to the negative impacts of people's travel behaviour. As outlined in Chapters 1 and 3, reliance on cars contributes to – among other problems – climate change, air pollution, ill health, congestion and accidents. It was argued that where technological solutions to these problems are possible, they remain distant. Behaviour change – people switching from car use to other modes and/or avoiding some travel altogether – may be more effective, more quickly.

The thesis focused on commuting because it offers considerable scope for positive change. If some of the 71.2% of UK workers who commute by car (ONS, 2002) switched to other modes, emissions, congestion and accidents might all be cut. People's health would benefit from walking or cycling and this could have knock-on effects; raising economic productivity and easing pressure on health services.

The thesis aimed to propose psychological and contextual influences on travel mode choice for commuting, focusing on drivers' reasons for maintaining or reducing their car use. Two theories were applied; Schwartz's (1977) norm-activation theory (NAT) and Ajzen's (1991; 1991a) theory of planned behaviour (TPB). Study 1 used inferential statistics to compare the theories' ability to explain drivers' car use intentions.

Explanation was improved by a model that used constructs from both theories and improved again by adding contextual variables to this model. Study 2 investigated the extent to which interviewees used discourses echoing NAT and the TPB when explaining their commuting behaviour and identified additional discourses relating to other motives. Thus, the two studies used different methods to examine people's stated reasons for their commuting intentions and behaviour, but it is argued that these methods are complementary. Both studies assumed that while behaviour may systematically relate to enduring psychological states (Breakwell, 1993), we cannot directly access these and so cannot be certain of their existence. Nonetheless, the psychological constructs that comprise attitude-behaviour theories do seem to be associated with people's actions. They are a useful device and their measurement at a given point in time may illuminate enduring mental features that direct behaviour. Given the inherent uncertainty in trying to discover why people do what they do, this seems to be the best available approach.

### **7.3 Towards a synthetic theory**

#### **7.3.1 *Applicability of NAT and the TPB to commuting mode choice***

Chapter 4 reviewed ESB research using NAT and/or the TPB. Despite problems directly comparing studies, it was concluded that both theories are useful in this domain. Each captures different motives and together they account for various altruistic and self-interested concerns. In published studies, models using constructs from both theories tend to explain more variance in ESB than either theory alone (see Chapter 4, section 4.6.1.1). Study 1 of this thesis provides further evidence of this.

The psychological model comprising a responsibility/obligation construct (AR/PN) from NAT and perceived behavioural control (PBC) from the TPB explained 37.7% of variance in drivers' car use intentions (based on  $R^2$  and compared to 25.9% for the TPB and 34.1% for NAT). The information criteria statistics showed that this model also struck a better balance between parsimony and goodness-of-fit than either individual theory's model. As Harland *et al.* (1999) note, the TPB does not capture all moral motives for ESB and equally, one can say that NAT does not capture all non-moral motives. Their combination exemplifies a step towards the empirically-founded 'synthetic theory' for which Stern (2000) calls.

Study 2 also provided support for a theory based on components of NAT and the TPB. Some participants gave mutually-reinforcing moral and practical reasons for choosing particular travel modes. Furthermore, some people expressed moral motives for avoiding car use, but used the driving-as-necessary discourse to state inability to do so. This echoes study 1, where PBC partially moderated AR/PN's influence on car use intentions (i.e. the strength of the AR/PN-intention relationship was related to people's level of PBC). This is a key finding. Two studies using different methods suggest that whether moral motives are actually manifest in the mode a person uses for commuting is to some extent governed by perceived ability to act on those motives.

Based on the above, it is argued that a model of travel mode choice should draw on both NAT and the TPB for its component parts. Sections 7.3.2 to 7.3.6 examine those components in greater detail, suggesting which should be included and why. Section 7.3.7 then describes the proposed model.

### *7.3.2 Responsibility and obligation*

Both studies undertaken for this thesis raise questions about Schwartz's (1977) theoretical distinction between feelings of personal responsibility and obligation (see Chapter 4, section 4.4). Although some ESB studies have empirically differentiated these constructs, others have been unable to do so (see Chapter 5, section 5.7.1). The present research encountered this difficulty. AR and PN items loaded high on the same factor in the study 1 principal components analysis. It was acknowledged in Chapter 5 that the low number of AR and PN items may have contributed to this result, but it is notable that study 2 participants seemed to use responsibility and obligation interchangeably. In this second study, number of items was not a confounding factor, so overall these findings indicate that people involved in this research saw no substantive difference between the constructs.

The *Oxford Dictionary of Philosophy* (Blackburn, 1996) defines 'responsibilities' as "those things for which... [people] are accountable; failure to discharge a responsibility renders one liable to some censure or penalty". 'Obligation' is defined as "an action that is required of one". It is easy to see why people may have difficulty distinguishing between these ideas. Failure to perform a 'required' action could lead to 'censure or penalty' and one may be 'accountable' for such actions. There is conceptual overlap here and on the evidence of this and other research (e.g. Hunecke *et. al.*, 2001;

Matthies *et. al.*, 2002), it is arguable that Schwartz's (1977) separation of responsibility and obligation does not always reflect people's own expressions of moral motives. The extent to which people use these concepts interchangeably or characterise them as distinct is a question for future research.

### 7.3.3 *Personal and social norms*

Schwartz (1977) proposed that personal norms (PN) often capture social norms. He defined social norms as what people "perceive others expect of them" (*Ibid.*, 270), mirroring Ajzen's (1991a) subjective norm (SN) construct. This implies that there is no need for SN in psychological models containing PN. Indeed, Schwartz (1977, 271) presents results showing that "perceived social norms failed to add significantly to the variance" in altruistic behaviour explained by PN.

However, Schwartz (*Ibid.*) also notes that sometimes there are conflicting social norms around an issue (as in study 2, where participants spoke of both anti- and pro-driving pressure). In such situations, people may perceive social norms that conflict with their PN and these social norms might add to explained variance in behaviour. Hence, Schwartz called for studies "in which both types of norm are measured" (*Ibid.*, 272).

Study 1 did this. Perceived expectations of friends had a statistically significant influence on car use intentions in a regression testing the TPB (see Chapter 5, section 5.5.2), but this variable was non-significant when included alongside AR/PN, echoing Schwartz's (1977) findings. Although the two SN items did not form a reliable scale, perceptions of one referent group's wishes (friends) did not improve explanation of intentions above and beyond normative self-expectations, while these perceptions were significant before self-expectations were taken in to account.

Some study 2 participants alluded to social norms surrounding travel, but rarely presented these as influences on their commuting behaviour (see Chapter 6, section 6.5.1.4). Moral motives, however, were central in several accounts.

One could argue that these findings show that SN is not required in a 'synthetic theory' of commuting mode choice. However, previous research suggests otherwise. Harland *et. al.* (1999) showed that PN and SN can simultaneously exert significant effects on car use intentions (see Chapter 4, section 4.5.2.4) and Bamberg & Schmidt (2003)

found that SN had a significant influence on self-reported modal choice while PN did not. PN does not always entirely mediate SN's effect on intentions and/or behaviour. Therefore, it is proposed that both variables should be retained when NAT and the TPB are combined to explain commuting intentions and/or behaviour.

#### *7.3.4 Attitude towards a behaviour and awareness of its consequences*

Oom Do Valle *et. al.* (2005, 389) used a model based on NAT and the TPB to explain recycling behaviour, stating that the "idea of combining these theories resulted from both sharing similar constructs." In particular, they suggest that awareness of consequences (AC) and attitude towards the behaviour (ATT) have "similar meaning" (Ibid., 370). They measured ATT and assumed that it captured identical beliefs to AC.

Oom Do Valle *et. al.* took a narrow conception of ATT and their items only elicited evaluations of recycling's environmental outcomes. If ATT is defined in this way, it does indeed capture the same beliefs as AC. However, this is not Ajzen's (1991a) conception of ATT; an overall evaluation of performing an act. While treating AC and ATT as analogous reduces the number of variables in a combined NAT/TPB model, it also reduces that model's ability to capture potentially-salient motives. Oom Do Valle *et. al.* (2005) combined NAT and the TPB on a questionable premise. It is useful to integrate them not because of their similarity, but because of their difference. They are different partly because ATT – on Ajzen's (1991a) definition – captures self-interested motives. Although neither ATT nor AC was a significant predictor of car use intentions when used in the same regression in study 1, study 2 participants expressed instrumental motives of the type captured by ATT and characterised these as distinct from beliefs about behavioural consequences. It is therefore argued that both ATT and AC should be parts of a 'synthetic theory' and that ATT should be operationalised to capture overall evaluations of performing an act.

#### *7.3.5 The importance of context*

While the psychological model comprising AR/PN and PBC explained more variance in drivers' car use intentions than either individual theory in study 1, it explained less variance (and had higher information criteria values) than a model that also included contextual variables ( $R^2 = .481$ ).



In many ways, study 2 reinforced study 1's results. For example, some people (e.g. Alun and Carl) said that their commuting behaviour was influenced by contextual variables such as the cost of driving. But study 2 also provided additional insights, because it enabled participants to give reasons for their behaviour that were not allowed by the response options in the study 1 questionnaire.

The driving-as-necessary discourse was often invoked to explain why motives for avoiding car use were not acted upon. As well as feelings of responsibility and obligation, these included affective evaluations of particular modes (e.g. Ursula). This is another key finding; (perceived) context and low behavioural control were given as reasons why affective as well as moral motives failed to manifest themselves in people's commuting behaviour. Whether this generalises to other settings and other behaviours is a question for future studies. It could be explored both qualitatively and by statistical tests for a possible moderating effect of PBC on affect-intention or affect-behaviour relationships.

Similar interactions were suggested by some study 2 participants' references to context when explaining changes in their commuting behaviour. Rick's account was examined in Chapter 6, section 6.5.1.3 and it was reported that he had reduced his car use in favour of more cycling. This partial switch of modes was attributed not only to his enjoyment of cycling and its health benefits, but also to the fact that his commuting distance had been halved by moving campus, making cycling a practicable option. Rick – and Alun and Wendy, who also implicated contextual changes in their modal switch – presented journey distance as a determinant of whether psychological motives were actually brought to bear on commuting behaviour. Rick explained that when his context had been prohibitive of bicycle use (because his commute was over 20 miles) he had driven to work, but when this barrier was removed, he had been able to act on his enjoyment of cycling and his appreciation of the exercise it provided. Like Ursula's, Rick's account suggests that it would be interesting to statistically analyse the possibility of PBC moderating the relationship between affect and behaviour. Moreover, since he identified (instrumental) health benefits to cycling, we might also ask whether PBC moderates the ATT-behaviour relationship.

Another important point is that personal characteristics often mediate contextual influences on behaviour (see Chapter 3, section 3.3.2). It can, therefore, be difficult to

distinguish choice from necessity (Handy *et. al.*, 2005). Indeed, as proposed in Chapter 6, one person might describe driving as necessary while another person in a comparable situation would describe it as much more practical than the alternatives. They might characterise the same situation in different ways. Thus, it is useful to measure both PBC and 'objective' context. Study 1 showed that these variables can have independent effects on car use intentions. Moreover, asking participants how context affects their perceived behavioural control reveals individual differences in this regard, helping to explain why people act differently in similar situations.

As well as physical context, the research examined how socio-demographics relate to car use intentions and commuting behaviour. Study 1 found that age, income and full- or part-time status had significant effects on intentions. Older, higher earning and full-time respondents were more likely to express intentions to maintain their car use for commuting. Explanations for these findings were suggested in Chapter 5, section 5.7.3.2, but are necessarily speculative. It should also be remembered that socio-demographics should sometimes be seen as proxies for other influences on intentions and behaviour (see Chapter 3, section 3.3.2.2). If researchers could identify these influences, it may be better to measure them than age, income and so on.

Study 2 showed no clear patterns of participants with certain socio-demographic characteristics invoking particular discourses. Patterns may be hard to identify in such a small sample ( $n = 24$ ), but on the available evidence, socio-demographics added little to the understanding of commuting mode choice provided by study 2.

In summary, the studies reported in Chapters 5 and 6 illustrate various ways in which context may directly influence commuting behaviour, or interact with personal characteristics to do so. As such, there are several reasons for ensuring that contextual variables (both 'objective' and perceived) are included in models designed to explain such behaviour.

### **7.3.6 *Psychological motives not captured by NAT or the TPB***

The review of travel psychology studies presented in Chapter 3 found some influences on modal choice that are not accounted for by NAT or the TPB; most notably, affective evaluations, social-symbolic motives and habits.

Research into affective motives for travel is in its infancy (see Chapter 3, section 3.2.1). While there is mounting evidence that affect plays some role in directing how and if people travel, it remains unclear how affect should be defined and measured in this domain (see Chapter 3, section 3.3.1.2). Nonetheless, “subjectively experienced feeling” (Colman, 2001, 16) can be distinguished from the altruistic motives captured by NAT, is not necessarily captured by the TPB and can, therefore, be identified as a distinct influence on modal choice.

Although study 1 did not include affect measures, study 2 participants discussed affective motives for their commuting behaviour, suggesting that any theory of modal choice should include such motives. As Steg, Vlek & Slotegraaf (2001) point out, caution is needed when examining affective influences on travel because the importance attached to them seems to be (at least partly) contingent on how they are measured. Some authors suggest that this applies to drivers more than users of other modes (Ibid.; Steg, 2005), although study 2 participants tended to cast affect as a relatively unimportant consideration regardless of which mode(s) they used (see Chapter 6, sections 6.5.1.3 and 6.6).

The potential for social-desirability bias in data on affect highlights an issue for future research: the development of methods that minimise this bias. Other interesting questions concern which affective experiences (e.g. fun, stress, pleasure in exercising skill, pleasure from privacy) influence modal choice for different journey types (e.g. commuting and leisure). There are also unresolved issues of what constitutes affective experience and if and how this should be distinguished from its causes. But what already seems certain is that travel has affective benefits and can be more than a means to an end (e.g. Anable & Gatersleben, 2005).

Chapter 3 revealed some overlap between affective and social-symbolic motives and reported attempts to broaden ideas of social influence on travel beyond the perceptions captured by SN. There is some evidence that modal choice is associated with status (Ellaway *et. al.*, 2003) and is used to present a particular image (Steg, 2005). Notably, however, these themes were absent from study 2. No participant presented status as a reason for their modal choice, or said that their decisions about how to commute were influenced by image concerns. It seems unlikely that this was because of the questions that were asked, one of which was “Do you feel that your decisions about how to travel

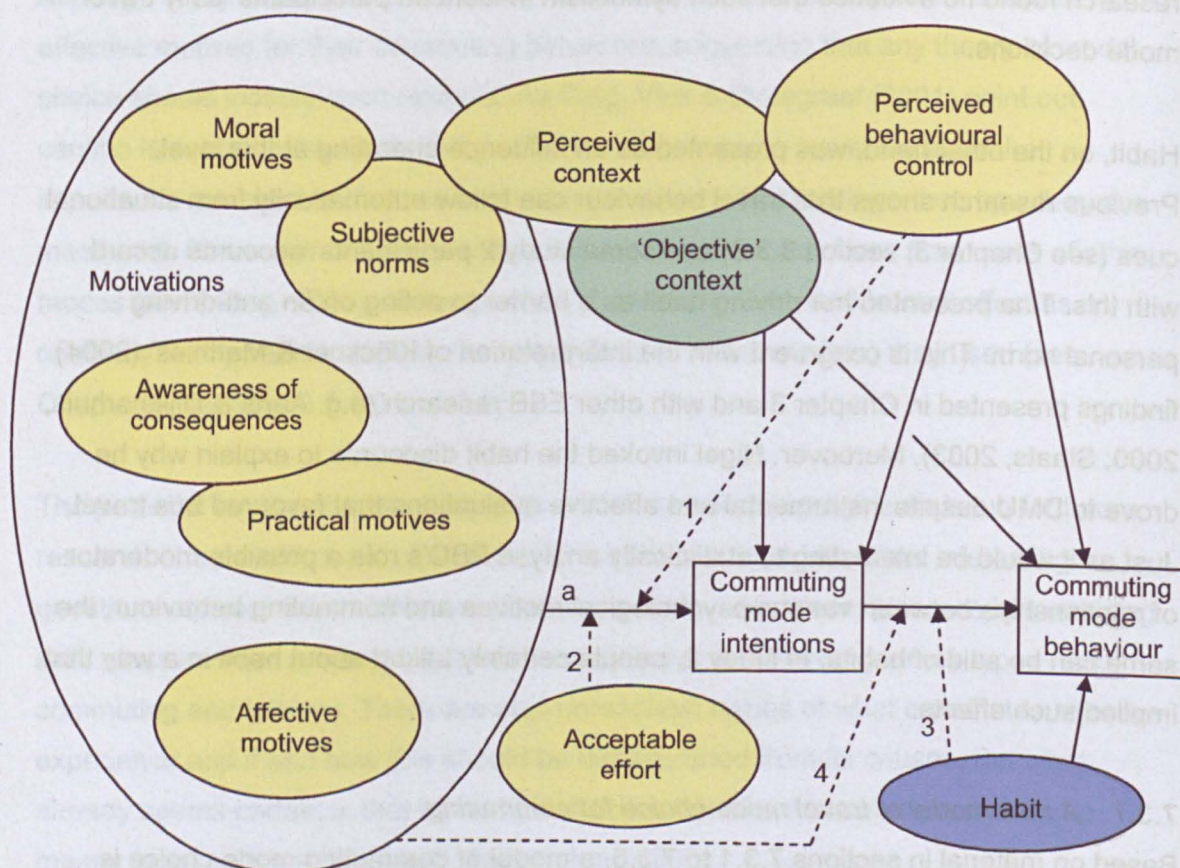
say anything about you as a person?" (see Appendix 2). It may have been because people were wary of appearing concerned with status or image if this was perceived as socially undesirable. Or these influences on travel behaviour may not operate at the level of modal choice for particular journeys (at least in this research setting). Perhaps they influence whether people own cars and, if they do, what cars they choose. (Beryl, for example, said that she drove a Volkswagen Golf and "wouldn't have just any car".) Thus, while it may be true that "the vehicle you drive has long been seen as a symbol of your wealth, taste, style and – some would say – virility" (Wilson, 2004), this research found no evidence that such symbolism influenced participants' daily travel mode decisions.

Habit, on the other hand, was presented as an influence operating at this level. Previous research shows that travel behaviour can follow automatically from situational cues (see Chapter 3, section 3.3.3) and some study 2 participants' accounts accord with this. Tina presented her driving habit as a barrier to acting on an anti-driving personal norm. This is congruent with the interpretation of Klöckner & Matthies' (2004) findings presented in Chapter 3 and with other ESB research (e.g. Aarts & Dijksterhuis, 2000; Staats, 2003). Moreover, Nigel invoked the habit discourse to explain why he drove to DMU despite instrumental and affective evaluations that favoured bus travel. Just as it would be interesting to statistically analyse PBC's role as a possible moderator of relationships between various psychological motives and commuting behaviour, the same can be said of habits. In study 2, people certainly talked about habit in a way that implied such effects.

### *7.3.7 A new model of travel mode choice for commuting*

Based on material in sections 7.3.1 to 7.3.6, a model of commuting mode choice is proposed that takes account of findings from this research and other studies reviewed in the thesis (*Figure 7.1*). This model may not apply to settings outside DMU, or even to other samples from DMU's population. Qualitative research like that presented in Chapter 6 is concerned with individual idiosyncrasies as much as generalisable patterns. The claim is that this model is "a simplified... idealized... representation" (Colman, 2001, 739) of influences on commuting mode choice among participants in this research. It is also acknowledged that every aspect of the model will not apply to every participant. Doubtless some of the 312 participants in study 1 had motivations for commuting by particular modes that are not shown here. Even in study 2, some stated

motives were unique to one individual. *Figure 7.1* represents influences on commuting mode choice that were statistically significant in study 1 and/or were the subjects of shared discourses in study 2, but for most people only some of these influences seemed salient. Furthermore, there may be relationships between components of the model that are not shown in *Figure 7.1*. For example, study 2 suggested that habits can prevent intentions from influencing behaviour (arrow '3'). However, the study did not provide data on the possibility of habit influencing motivations' relationships with intentions. Nor does other travel research typically address this question.



*Figure 7.1* A model of commuting mode choice

*Figure 7.1* is explained in the following points.

- Solid arrows represent direct relationships and assumed causal directions.
- Each separate 'motivation' is expected to have a direct effect on intentions, but these effects are all represented by horizontal arrow 'a'.



- The colours assigned to each type of influence echo *Figure 3.1*, which illustrates Stern's (2000) categorisation of influences on ESB. 'Psychological factors' are in yellow, 'contextual factors' green and habits blue.
- There is no significance to influences' vertical position. For example, the fact that subjective norms are above affective motives (e.g. stress, enjoyment of exercising skill) is not intended to convey anything about their relative importance or relationship to one another.
- Overlapping bubbles, however, do show relationships. They signify conceptual overlaps. For example, perceived behavioural control is partly based on perceived context (e.g. job requirements, journey distance), while moral motives (which include both normative self-expectations and feelings of responsibility) partly account for subjective norms.
- Acceptable effort is based on the idea (proposed in Chapter 6, section 6.6.1) that laziness is another way of talking about the amount of effort someone is willing to exert on a behaviour. Since asking whether people consider themselves lazy may elicit socially-desirable responses, it may be better to ask how much effort they are willing to exert on commuting, which is arguably a less loaded question.
- Although acceptable effort and PBC would be called 'psychological factors' on Stern's (*Ibid.*) categorisation, they differ from those grouped on the left of the model. These can be seen as 'motivations', while effort and PBC may determine how much influence motivations have on intentions and/or behaviour.
- Perceived context is assumed to influence intentions and behaviour via PBC. 'Objective context' (e.g. not possessing a car) may also have direct effects.
- Arrow '1' represents the idea that PBC can partially determine the influence of motivations on intentions.
- Arrow '2' represents the idea that acceptable effort can partially determine the influence of motivations on intentions.
- Arrow '3' represents the idea that habit can partially determine the influence of intentions on behaviour.
- Arrow '4' represents the idea that intentions can be overridden by conflicting motivations (e.g. an intention based on moral motives may later be overridden by self-interest).

This model departs from Schwartz's (1977) NAT in several ways.

- It includes non-moral motivations (e.g. evaluations of travel modes' practical and affective functions) alongside moral ones (obligation and responsibility).
- It includes subjective norms alongside personal norms, on the assumption that PN does not always capture SN.
- It combines feelings of responsibility and obligation into a single construct capturing moral motivations, rather than separating them.
- It includes contextual influences on behaviour.
- It includes intentions. Schwartz (Ibid.) did not specify this construct in NAT but subsequent research – including study 1 of this thesis – shows that PN can influence intentions as well as behaviour (e.g. Harland *et. al.*, 1999).
- It includes PBC on the basis that this variable moderated the AR/PN-intention effect in study 1.
- It includes habit and acceptable effort, both of which may intervene in the relationships between motivations and intentions/behaviour.

The model also departs from Ajzen's (1991; 1991a) TPB in several ways.

- It includes moral motivations. These *may* be captured by ATT, but this depends on how it is operationalised.
- It includes affective motivations. Again, ATT *may* capture these but it is argued that affect should be included as a distinct construct to differentiate emotional from instrumental evaluations.
- It includes 'objective' contextual factors. Efforts should be made to measure these where possible as they can influence intentions and behaviour independent of PBC and it is interesting to compare people's perceptions with actual conditions (e.g. how far is 'too far from a bus stop'?).
- It includes habit and acceptable effort, both of which may intervene in the relationships between motivations and intentions/behaviour.

The proposed model bears some similarity to Triandis' (1977) theory of interpersonal behaviour (TIB). This comprises PN, affect, behavioural, control and normative beliefs (of the type underlying ATT, PBC and SN), role beliefs, habit and intentions. The only components of the model proposed here that are not shared with the TIB are AC, acceptable effort, role beliefs and some measure of 'objective' context. Time constraints on this research meant that the TIB could not be tested in a second

quantitative study of commuting mode choice at DMU, but this would be an interesting project. It may be that in focusing on the more popular NAT and TPB, a model well-suited to the research setting was overlooked.

In fact, the TIB has been shown to be a good predictor of (self-reported) modal choice. Bamberg & Schmidt (2003) compared it to NAT and the TPB and, using the same sample, it explained 51% of variance in behaviour and 68% of variance in intentions. NAT explained 14% of variance in behaviour (intention was not included) and the TPB explained 45% and 60% of variance in behaviour and intentions, respectively.

Bamberg & Schmidt also tested a model integrating NAT, the TPB and the TIB. Its overall performance was very similar to the TIB's; explaining 52% of variance in behaviour and 68% of variance in intentions. There were differences in individual constructs' effects, however. In the TIB, only behavioural beliefs, control beliefs and role beliefs were significant ( $p < .05$ ) predictors of intentions and only intentions and habit were significant predictors of behaviour. In the combined NAT/TPB/TIB model ATT, PBC, SN and role beliefs significantly predicted intentions and, again, intentions and habit significantly predicted behaviour.

What is most notable when comparing these findings with study 1's is the relative importance of motivations captured by NAT in the research undertaken for this thesis. As Bamberg & Schmidt (*Ibid.*, 281) note, their young, student sample apparently did not "perceive car use as a behavior with moral implications." They suggest that SN was much more influential than PN because students are more susceptible to peer pressure than older people in other settings. Certainly the older, more diverse sample in studies 1 and 2 identified a moral aspect to commuting. The TIB would account for this, reinforcing the idea that it may explain commuting behaviour at DMU.

As discussed in section 7.3.4, Oom Do Valle *et. al.* (2005) have also tested an integrated NAT/TPB model (of recycling behaviour in Portugal). This included ATT, PBC and SN from the TPB (intention was not measured), along with PN from NAT (AC was considered analogous with ATT and AR was not measured). Also included were various antecedents of these constructs: values, general (as opposed to behaviour-specific) environmental attitudes and specific beliefs such as knowledge of how to recycle that were assumed to influence PBC. The model explained 71.8% of variance



in self-reported recycling. Despite this impressive level of explanation, this model may not generalise to other behaviours. Some of its variables (e.g. knowledge of recycling gained from government campaigns) are specific to the research setting, although it may be possible to devise similar variables relating to other behaviours elsewhere. In any case, Oom Do Valle *et. al.* (Ibid.) set out to explain recycling behaviour in Portugal under that country's particular circumstances, so they cannot be criticised for producing a model appropriate for that purpose.

Much the same could be said of the model put forward here. As stated, it was developed from DMU participants' data and is intended as an explanation of commuting mode choice in this setting, although it would be interesting to see how well it generalises. It is proposed that this model – which integrates NAT and the TPB on the basis that they capture different motives – should explain more variance in commuting mode choice at DMU than either individual theory or a model including only NAT and TPB variables. Some evidence for this has been provided by studies 1 and 2, but further tests would be useful both within and beyond DMU.

#### **7.4 This thesis in the bigger social-scientific picture**

This thesis has examined a specific type of behaviour (commuting) using common theories in quantitative environmental psychology research. In terms of both social psychology and travel and transport studies, it occupies small corners of large fields. Because of its specific focus, the thesis necessarily ignores some aspects of travel psychology and behaviour. However, although these have not been examined empirically, they should not go unacknowledged. Section 7.4.1 outlines some theories and ideas that are not common in ESB research and suggests ways in which they may help to progress it. Section 7.4.2 then has some comments on methodology.

##### **7.4.1 Complementary theoretical approaches**

While the thesis has attempted to develop the attitude-behaviour approach by borrowing from discourse analysis, it has still focused on individuals' motivations. Many social scientists and even psychologists take different approaches. For example, Moscovici's (2000) social representations theory (SRT) is not particularly concerned with individuals' attitudes or behaviour. Rather, it focuses on shared ideas – representations – and treats these as units of analysis. SRT was first developed as an attempt to understand “the transformation of scientific knowledge into common

knowledge" (Ibid., 228) and seeks to explain the mechanisms underlying ideas' origins, development and communication.

SRT reminds us that the immediate antecedents of individuals' travel behaviour are part of a larger causal process. Taking an SRT perspective, we might ask where people's attitudes originate and how they relate to shared representations of travel. There is a connection here with the discourse analytic techniques applied in study 2, which focused on shared ways of explaining and justifying commuting behaviour. One difference between this and an SRT approach is that SRT is concerned not so much with what ideas are shared and how they are employed rhetorically, but with those ideas' genesis and transformation over time (Castro & Lima, 2001). Nonetheless, SRT might help us to understand where discourses such as those evident in study 2 come from and how they become prevalent.

The potential for applying SRT to travel can be illustrated by a real-world example. On July 7<sup>th</sup> 2005, bombs exploded on three underground trains and a bus in London; killing 56 people. Such events receive enormous media coverage, which may be a source of shared representations.

A BBC news report on Londoners' reactions to the bombings (Geoghegan, 2005) included the following quotation from Professor John Maule of Leeds University's Centre for Decision Research.

Without the availability of statistics for us to work out the exact likelihood of being involved in an explosion, people do their own mental short-cuts. One factor is the availability of images in our mind, which dictates how soon the event could happen again. Pictures of the blast aftermath are so powerful and so omnipresent they stick in the memory, so people overestimate the likelihood of these events happening again. How readily can you bring to mind the image of a cyclist being knocked down? Not easily, because the media isn't interested and that's the lens through which we learn about the world.

Professor Maule was discussing the reported 30% increase in commuter cycling (Ibid.) immediately after the bombings. Many Londoners apparently reacted by switching to a travel mode that they perceived as safer than public transport. This perception, Professor Maule argued, was based on media coverage rather than experience. One

might hypothesise that a media representation rapidly became a social representation, which was accepted by individuals with an immediate effect on many people's commuting behaviour. Unlike attitude-behaviour research, this perspective does not illuminate the mechanisms by which psychological states influence actions, but it is complementary. It asks how those states arise in the first place; a no less important question.

Representations of risk are not the only pervasive idea that may influence travel. Another is personal freedom; seemingly a core value in contemporary UK society. To illustrate, consider how politicians frequently refer to freedom of choice when promoting unpopular policies. The following text is from the UK government Department of Health website (DoH, 2005) and refers to reforms allowing private companies to provide services on behalf of the National Health Service (NHS).

System reform represents a group of interconnected policies that aim to support the transformation of the NHS to a system that is truly patient-led. They will give patients more choice, more personalised care and real control to improve their own health.

Similarly, the following excerpt is from a speech by David Miliband, UK School Standards Minister (Miliband, 2005).

Aneurin Bevan [a politician instrumental in establishing the UK welfare state] used to say that the freedom to choose was worthless without the power to choose. This is the power of personalised learning. Not a false dichotomy between choice and voice but an acceptance that if we are to truly revolutionise public services then people need to have both.

Now consider this statement from an interviewee (an account manager for a computer supplier, not a transport specialist or social scientist) on the BBC's *Car Nation* programme, which aired on July 3<sup>rd</sup> 2005 and took "a novel look at 21st century society, exploring the lives we lead and the people we are by assessing motoring behaviours and obsessions" (BBC, 2005).

Whenever we feel trapped or ground down by life, our cars tempt us with the promise of freedom.

This remark suggests that the prized asset of freedom has become associated with cars. (This seems to have happened outside the UK as well, as suggested by Hagman's (2003) identification of a discourse of freedom through car use in Sweden. See Chapter 2, section 2.3.) Perhaps this explains UK government's reluctance to discourage driving (e.g. by raising petrol tax; a move which was repeatedly deferred between 2003 and 2005). Although study 2 participants did not invoke personal freedom to explain their commuting mode choice, some talked of attaining freedom through car ownership. As with representations of risk, it would be interesting to study representations of freedom and their relationship to travel behaviour. Again, this type of work would take a more macro-level approach than the research presented in Chapters 5 and 6, but could help to elucidate broader social processes.

Like SRT, Breakwell's (1993) identity process theory (IPT) could provide new insights in travel psychology, but is yet to be applied. IPT was mentioned in Chapter 3, section 3.3.2.2, where it was pointed out that the theory emphasises feelings of 'competence and control' as contributors to a positive self-identity. (IPT's other central propositions are that: 1) people strive for self-esteem, 2) people strive for continuity of identity, and 3) people like to be distinctive, but not too distinctive.)

It is interesting that several study 2 participants claimed not to have control over their commuting mode; that driving was necessary. Similarly, in study 1, a mean PBC score below the scale mid-point scale indicated that people generally expressed inability to reduce their car use. These findings might seem counter to IPT's assertions, but we should note Breakwell's (1986, 102) explanation of what control means in IPT: "Inner self-esteem derives directly from the experience of oneself as an agent who can make things happen in the world and of effectively realising one's intentions". If one's intention is not to avoid driving, but to get to work, a car may be ideal. Although the research reported here used far too unrepresentative a sample for generalisations to the UK population, sources like *Car Nation* suggest that most people's intention is simply to get to work. Whether cars provide control in this sense and whether this contributes to self-esteem are questions that IPT could help to answer.

One might also speculate on the utility of the distinctiveness proposition in travel psychology. Does choosing a car from the alternatives marketed at different groups with supposedly different aspirations and images (Wilson, 2004) express

distinctiveness whilst also identifying with one's group, or with the majority of Britons who drive and who – on the basis that they are in a majority – presumably see driving as the norm (e.g. Sue's family in study 2)? Such questions are beyond NAT and the TPB's behaviour-specific focus but are still relevant to travel behaviour.

As well as the theories outlined here, others have been mentioned at various points in the thesis. Prochaska's (Prochaska & Norcross, 2001) transtheoretical model was applied in study 2 and its potential for illuminating the process of switching travel modes evaluated (see Chapter 6, sections 6.5.3 and 6.6.3). Steg's (2005) use of Dittmar's (1992) theory of material possessions and its similarity to Csikszentmihalyi & Rochberg-Halton's (1981) work were noted in the discussion of social motives in Chapter 3, section 3.3.1.3. Also in Chapter 3 (section 3.5), Giddens' (1990) ideas on trust were raised in relation to social dilemmas. There may well be other theories and methods from other areas of psychology and from other social sciences and humanities that could deepen our understanding of travel psychology and behaviour. Tapping these resources will take time, but may bring truly 'synthetic theory'.

The model of commuting mode choice proposed in section 7.3.7 is a small part of this larger enterprise; hence the claim that it is only a move 'Towards a synthetic theory'. The research questions asked and methods used to answer them in this thesis permit a limited set of conclusions that are embodied in the model. As such, this research and other travel studies using attitude-behaviour theories should be seen as complementary to work (apparently yet to be done) using different theories and approaches. Models like that proposed here may explain the latter stages of processes underlying behaviour, but should be situated within a project that also examines broader socio-cultural forces (Huguenin, 2005).

#### **7.4.2 *Appropriate methods***

The project alluded to above should utilise a range of methods that are appropriate to the range of theories at our disposal. This thesis has attempted to show that even in attitude-behaviour research, we can go beyond questionnaire data and statistical analysis. As has been stressed throughout, data gathered by survey items and by interviews are not so different, in that neither can be taken to reveal people's 'inner realities'. As several authors note, combining quantitative and qualitative methods has advantages (e.g. Robson, 2002); enabling the study of population trends and individual

differences. "One can conduct traditional quantitative research, and if the results suggest something intriguing that warrants further consideration then it can be followed up with in-depth qualitative analysis" (Manzo, 2004a). Furthermore, we should recognise that qualitative methods are not restricted to analysis of talk. Study 2, for example, used a ranking task to illuminate participants' perceptions of the relative importance of different influences on their commuting behaviour.

Combining different methods also helps researchers to avoid 'inappropriate certainty' (see Chapter 6, section 6.2), making results more robust. It is, therefore, suggested that mixed-method research offers good prospects for developing our understanding of travel psychology. If we expand the portfolio of theories used in the domain to include those such as SRT and IPT, this will necessarily require a range of methods which, it is argued, can be beneficial. The risk of too much theoretical and methodological diversity in studies purportedly applying the same theories was highlighted in Chapter 4, but in the 'bigger picture', diversity is required. We cannot properly examine individuals' attitudes and large-scale social forces using just one method.

## **7.5 Policy suggestions**

Commenting on the goals of attitude-behaviour research, Moscovici (2000, 234) asserts that those working in the field wish to

study a kind of substitute for behaviour, one could say a pre-behaviour, which would permit them to predict behaviour... There is also an underlying idea that if we can predict behaviour, we can change it.

This thesis – although largely concerned with theory development – subscribes to the aim of changing travel behaviour. The theory development's ultimate goal is to inform policies that might reduce car use. What policies can be suggested based on the work presented here?

Firstly, some policy measures can be ruled out. As Tertoolen *et al.* (1998) show, people may react against being told not to drive (see Chapter 3, section 3.6). Given Breakwell's (1993) argument that feelings of control over one's actions contribute to a positive self-identity, this is unsurprising. Similarly, Schwartz (1977, 269) argues that exhortations to act in particular ways

may block the activation of personal norms or lead the actor to feel deprived of freedom of choice and hence responsibility and self-satisfaction. Social articulation of a norm may create a perception of social pressure to act which elicits reactance, especially in the absence of attention to those elements in the situation which lead to the spontaneous activation of personal norms.

According to NAT, one of these elements is awareness of behaviour's consequences. Might information on the environmental benefits of reducing car use, rather than just telling people to drive less, be effective? Encouragingly, Steg (2003a) and Steg & Vlek (1997) found that AC was positively related to acceptance of policies that would increase the cost of car use (see Chapter 3, section 3.6). However, they also found that measures evaluated as being acceptable were evaluated as being potentially ineffective in changing behaviour. People may simply pay whatever they have to for their car use if – as this and other research (see Chapter 3, section 3.3.1.6) suggests – it is perceived as necessary. (As Ursula said in study 2, "The cost of driving? I don't really think about it because I've got to do it. I just pay what I pay.")

Furthermore, Chapter 6 showed that some people who expressed concern over the environmental impacts of their car use still commuted by car every day. Chapter 4 showed that where AC's direct effect on ESB has been measured, the relationship is unreliable (see section 4.5.3.3).

Indeed, policy studies show that information-only measures are largely unsuccessful. Evaluation of the UK government's *Are you doing your bit?* campaign (Collins *et. al.*, 2003, 46), which ran from 1998 to 2000 and spent over £28 million on advertising that promoted pro-environmental behaviours (e.g. boiling only as much water as required) concluded that

information does not necessarily lead to increased awareness, and increased awareness does not necessarily lead to action. Information provision... must be backed up by other approaches.

What might these approaches be? Collins *et. al.* (Ibid., 31) suggest that *Are you doing your bit?* failed because "it did not address issues of price and convenience". Convenience certainly seems to be crucial. Although the TPB associates convenience with the ATT construct and ease/difficulty with PBC, people may link these notions. In

research conducted for this thesis, participants reported that driving is convenient and other modes generally less so and this may be re-stated as an inability to reduce car use; driving-as-necessary. It seems that non-car modes must be made more convenient, reliable, flexible, accessible and so on. In other words, they should be made easier to use and, importantly, be perceived as such. As several authors point out, people will only change their behaviour if they see a viable alternative (e.g. Ibid.; Steg, 2003a). The success of Aalborg's cycling scheme, where bicycles were provided as an alternative to driving, illustrates that behaviour change can be achieved when this condition is met (see Chapter 3, section 3.6).

Based on the above, the effectiveness of car-use reduction policies should be maximised when they:

- engender feelings of personal responsibility and obligation rather than simply asserting social norms, *and*
- provide information on the positive impacts of switching modes, *and*
- demonstrate that switching modes is easy, *and*
- demonstrate that switching modes is worthwhile in terms of its outcomes.

This last point may be essential in overcoming the social dilemma of travel (see Chapter 3, section 3.5). Even if people believe that avoiding car use is morally right and environmentally beneficial, they may not do so if they see their actions as insignificant. Steg (2003a) and Steg & Vlek (1997) report that such beliefs were related to acceptance of car-use reduction measures, although they did not examine links to actual behaviour.

The social dilemma reminds us of the importance of trust to pro-environmental behaviour change. If people are to believe that their behaviour will impact upon problems about which they are concerned, they must feel that others are acting towards the same ends (Collins *et. al.*, 2003; Gatersleben & Uzzell, 2001).

Engendering such feelings may be difficult. As reported in Chapter 3, Giddens (1990) has proposed that modern society undermines trust (i.e. general confidence in others, rather than beliefs that they will keep explicit promises). This position is echoed by Onora O'Neill (2002), Professor of Philosophy at Newham College, Cambridge. In a lecture broadcast on BBC Radio 4, she remarked that



mistrust, it seems, is now directed not just at those clearly in breach of law and accepted standards, not just at crooks and wide boys. Mistrust and suspicion have spread across all areas of life.

There may, however, be ways around the lack of confidence that people have in one another. Although it might be hard to believe that a sizeable proportion of the whole population will switch from car use to other modes, it is easier to imagine that significant sections of smaller groups might do so. This may partially explain the success of some of the local car-use reduction initiatives detailed in Chapter 3, section 3.6. For example, Aalborg's cycle scheme (Marshall & Banister, 2000) involved nine local organisations; a well-defined target group. Members of this group could see relatively easily who else was involved and may, therefore, have found it easier to believe that their peers would switch travel modes than if the group had been bigger and its members largely unknown to each other. Of course, the disadvantage of specifically-targeted measures is that they influence the behaviour of relatively few people. Nonetheless, given the failure of national campaigns such as *Are you doing your bit?*, perhaps multiple local schemes offer better prospects.

This is the idea behind McKenzie-Mohr's (2005) community-based social marketing (CBSM) approach. Rather than relying on large-scale information campaigns, CBSM operates locally and involves four steps: 1) identify barriers and benefits to an activity, 2) develop a strategy using tools that have been empirically shown to be effective in changing behaviour, 3) pilot the strategy, 4) evaluate the strategy after implementation across the community. CBSM might promote changes in travel behaviour more effectively than information-only initiatives, but obviously requires more resources. It is not clear who would pay for these resources in the UK. It is probably fanciful to hope that some of the £37 billion to be spent by the Department for Transport between 2005 and 2008 could be directed towards CBSM.

Local government, however, has a role to play in reducing car use within its smaller jurisdictions. Even if approaches like CBSM are too resource-intensive, the context from which this thesis arose demonstrates at least one way in which Leicester City Council has influenced commuting behaviour in the city. By requiring DMU to implement a Green Travel Plan as part of its campus redevelopment, the Council contributed to a 5% reduction in the number staff and students driving to DMU

between 2003 and 2004; a target which was actually achieved a year earlier than planned (DMU, 2005). The Council is also legally required to produce a Local Transport Plan, the latest version of which was subject to public consultation when this thesis was submitted and was due for final publication in February 2006. This Plan has diverse objectives including tackling congestion, increasing accessibility and improving road safety and local air quality, but reduced reliance on cars and greater use of other modes, especially buses, are central to each of these aims (LCC, 2005).

The studies presented in Chapters 5 and 6 offer some insights with regard to targeting of measures, at least in the context of DMU. Study 1 showed that people who owned bicycles, lived relatively far from DMU and travelled to work alone were more likely to express intentions to reduce their car use for commuting. Younger, part-time and lower-earning members of the University were also more likely to express this intention. Most if not all of this information would be available to staff designing car-use reduction measures and could be used to target those most likely to respond positively. Study 1 also showed that people who stated that driving to work was expensive were more likely to express intentions to reduce their commuter car use. Cost perceptions could be elicited using a simple questionnaire item.

Study 2's small sample did not really enable conclusions about targeting, but did suggest that reducing the fixed costs of car use (tax, insurance, etc.) and replacing these with pay-as-you-drive charging may encourage car owners to use other modes. Study 2 also suggested that reducing the need for people to carry baggage, drive during working hours and dress smartly may remove barriers to use of non-car modes for commuting. It seems reasonable to assume that these issues may be relevant in many organisations.

In conclusion, the research undertaken for this thesis suggests various strategies for reducing commuter car use:

- encouraging people to feel personal responsibility and obligation over travel,
- providing information on the positive impacts of switching modes,
- demonstrating that switching modes is easy and worthwhile,
- targeting relatively small, bounded groups,
- charging for driving rather than for simply owning a car.

It must be remembered, however, that these suggestions are based on attitude-behaviour studies that largely ignored broader social issues such as representations of the car as a means of achieving control and personal freedom. These notions may be deeply ingrained in UK society and, as such, could hinder any attempt to reduce car use and promote alternatives.

# Chapter 8

## Conclusions

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Based on the premise that while attitudes may not be directly accessible, the notion of attitudes as enduring psychological states remains a useful device for understanding why people behave as they do, this thesis permits the following conclusions.

### 8.1 Theory development

Environmentally-significant behaviour (ESB), including reducing one's car use, can be motivated by altruistic and/or non-altruistic concerns. Study 1 showed that moral motives' influence on car use intentions was moderated by perceived behavioural control (PBC) and by aspects of perceived and 'objective' context. Study 2 participants' accounts of commuting reinforced these findings and also showed that some people gave both altruistic and self-interested reasons for using non-car modes. Therefore, Schwartz's (1977) norm-activation theory (NAT) and Ajzen's (1991; 1991a) theory of planned behaviour (TPB) are both useful in our attempts to understand travel psychology and behaviour. Models applied to modal choice should use constructs from both theories, as they are complementary. Affective motives for travel, habits and 'objective' and perceived context should also be included.

The studies presented in Chapters 5 and 6 raised questions about the distinction between feelings of personal responsibility and obligation among members of DMU who participated in the research. More work is needed to understand how these constructs relate to each other, especially as relatively few ESB studies that claim to apply NAT actually measure responsibility.

Study 2, in particular, highlighted the role of perceived context (e.g. how reductions in commuting distance were implicated in providing people with greater choice over their travel mode and thus in modal switch) in directing travel behaviour. This is a key finding of the present research, but it would be useful to replicate it in a more stable setting (i.e. where commuting distances did not change) to assess contextual influences on intention-behaviour relationships there.

## **8.2 Practical applications**

Based on the theoretical findings of the thesis, a number of suggestions have been made regarding measures designed to reduce car use.

- Interventions should not simply tell people not to drive.
- Nor should they only provide information on driving's negative impacts.
- The potential benefits of reducing car use should be pointed out, including the worth of the individual's contribution to tackling traffic-related problems.
- Interventions should engender internal motivations such as feelings of personal responsibility and obligation, rather than just asserting anti-driving social norms.
- Interventions should demonstrate that switching modes is possible or, better still, easy.
- Multiple small-scale, targeted interventions may be more effective in reducing car use than large-scale, non-targeted campaigns.

Even if these suggestions are followed, we should perhaps not be too hopeful of achieving behaviour change. This may sound pessimistic, but the studies undertaken for this research indicate that reduced car use was in some cases contingent on DMU's campus reorganisation; an event that is unlikely to be replicated in other settings. Moreover, in addressing individuals' attitudes, we seem to be swimming against a strong pro-driving tide at a societal level. Attitude-behaviour research only illuminates one part of a much bigger picture. There is hope that we can understand more of this picture by applying insights from other areas, however. Moscovici's (2000) social representations theory, Breakwell's (1993) identity process theory, Prochaska's (Prochaska & Norcross 2001) transtheoretical model and Giddens' (1990) work on trust have all been suggested as being potentially useful. Through use of such approaches by travel psychologists, we may achieve a 'synthetic theory' that can underpin more successful efforts to reduce car use than we have seen in the past.

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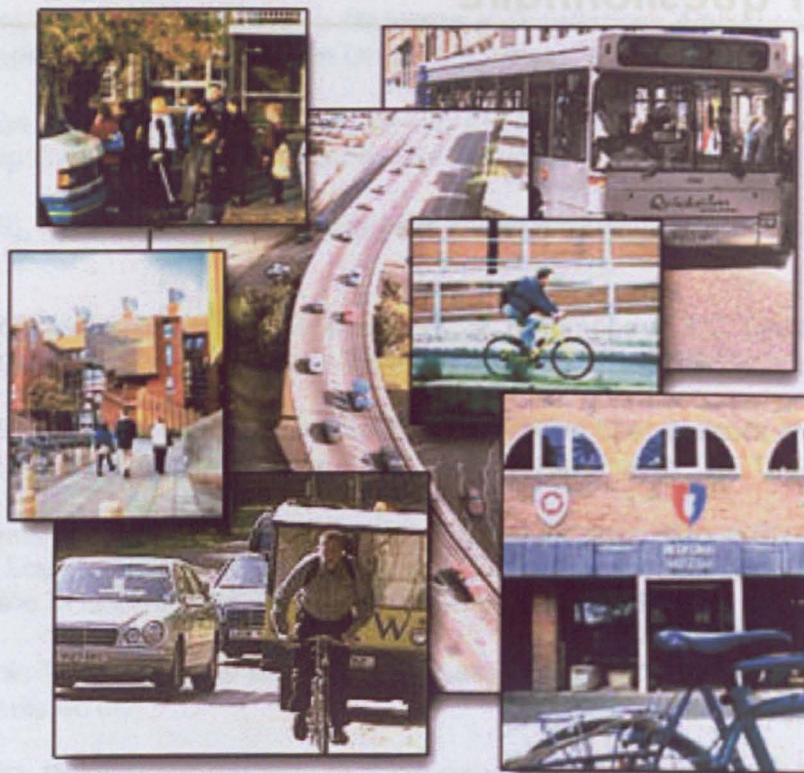
## **Appendix 1**

### **Study 1 questionnaire**

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# De Montfort University Travel Survey



## WOULD YOU LIKE TO WIN £100 AND HELP IMPROVE DMU'S TRAVEL FACILITIES?

Yes? Then complete the survey and enter the prize draw.

DMU is surveying staff and students about travel patterns – how we currently get to campus, how long it takes, the problems we find and what improvements are needed. The university recognises that the increasing levels of traffic on the roads are causing problems. Accidents, pollution, congestion and delays can damage people's health and the environment, and make commuting more stressful, difficult and time consuming. The university is therefore committed to improving facilities for – and access to – a variety of forms of transport including buses, trains, bicycles and walking, wherever possible. Completing this survey will help us to decide what facilities we should be offering.

This questionnaire has been prepared by DMU's Estates Department, with help from the Institute of Energy and Sustainable Development and the Department of Transport. It should take no more than fifteen minutes to complete and has been structured so that all questions should be relevant to you as a car user.

**All responses will be treated as strictly anonymous and confidential.**

## Section 1. Your journey to DMU

- 1 On which campus are you usually based? (Please tick two if split 50/50.)

☐ Leicester City

☐ Bedford Lansdowne

☐ Leicester Charles Frears

☐ Bedford A.S.H.

☐ Leicester Scraptoft

☐ Milton Keynes

☐ Bedford Polhill

- 2 How far is your home from your campus? (Please refer to your longest journey if your time is split 50/50 between two DMU sites.)

☐ 0 - 2 miles

☐ 10.1 - 20 miles

☐ 2.1 - 5 miles

☐ Over 20 miles

☐ 5.1 - 10 miles

☐ Unsure

- 3 How long does it usually take you to get: (please refer to your longest journey if your time is split 50/50 between two DMU sites)

a) from home to your campus?

b) home from your campus?

☐ 0 - 10 minutes

☐ 0 - 10 minutes

☐ 11 - 20 minutes

☐ 11 - 20 minutes

☐ 21 - 40 minutes

☐ 21 - 40 minutes

☐ 41 - 60 minutes

☐ 41 - 60 minutes

☐ Over 1 hour

☐ Over 1 hour

- 4 What time do you:

a) normally arrive?

b) normally depart?

☐ midnight – 8 am

☐ midnight – 9 am

☐ 8:01 am – 10 am

☐ 9:01 am – 1 pm

☐ 10:01 am – 1 pm

☐ 1:01 pm – 4 pm

☐ 1:01 pm – 4 pm

☐ 4:01 pm – 6 pm

☐ 4:01 pm – midnight

☐ 6:01 pm – 8 pm

☐ variable

☐ 8:01 pm – midnight

☐ variable



5 How often do you make a trip from your campus, for any purpose, during the working day? (If you never do, please go to question 8.)

☐ More than once a day

☐ About once a month

☐ Once a day

☐ Less than once a month

☐ 2 or 3 times a week

☐ Never

☐ About once a week

6 Where do you go? (Please tick all answers that apply.)

☐ Home

☐ Elsewhere for work

☐ Shopping

☐ To eat (e.g. lunch)

☐ To another DMU campus

☐ Other

7 How do you usually travel on your trips from DMU during the day?

☐ Car as driver

☐ Bicycle

☐ Car as passenger

☐ Walk or run

☐ Bus

☐ Motorcycle

☐ Train

Other (please specify)

8 What form of transport do you usually use for the main part of your journeys – in terms of distance – to and from university?

☐ Car as driver

☐ Car as passenger

9 How do you actually arrive on campus each day? (Please tick only one.)

☐ Car as driver

☐ Walk or run

☐ Car as passenger

☐ Motorcycle

☐ Bus

Other (please specify)

☐ Bicycle

10 Do you use another form of transport for the main part of your journey – in terms of distance – at least once a week? If so, what?

- |   |   |
|---|---|
| <input type="checkbox"/> Car as driver    | <input type="checkbox"/> Walk or run        |
| <input type="checkbox"/> Car as passenger | <input type="checkbox"/> Motorcycle         |
| <input type="checkbox"/> Bus              | Other (please specify) <input type="text"/> |
| <input type="checkbox"/> Train            | <input type="checkbox"/> No other form      |
| <input type="checkbox"/> Bicycle          |   |

11 Ideally, how would you most *like* to travel to the university?

- |   |   |
|---|---|
| <input type="checkbox"/> Car as driver    | <input type="checkbox"/> Bicycle            |
| <input type="checkbox"/> Car as passenger | <input type="checkbox"/> Walk or run        |
| <input type="checkbox"/> Bus              | <input type="checkbox"/> Motorcycle         |
| <input type="checkbox"/> Train            | Other (please specify) <input type="text"/> |

12 What are the advantages and disadvantages of your usual transport mode? Please tick one box on each row to say how much you agree or disagree.

	Disagree strongly	Disagree	Neither agree nor disagree	Agree	Agree strongly	Unsure
I nearly always arrive on time						
I get held up by traffic congestion						
I contribute to pollution						
Travelling to DMU is expensive						
I can get to work quickly						

My usual form of transport is...	Disagree strongly	Disagree	Neither agree nor disagree	Agree	Agree strongly	Unsure
Pleasant						
Uncomfortable						
Convenient						
Flexible						
Safe						

13 I have been a victim of crime because of my travel arrangements. ☐ Y ☐ N

14 I have been involved in an accident travelling to or from DMU. ☐ Y ☐ N

15 What are your attitudes to transport issues? Please tick one box on each row to say how much you agree or disagree with the statements.

	Disagree strongly	Disagree	Neither agree nor disagree	Agree	Agree strongly	Unsure
My transport choices can have an impact upon the environment						
Avoiding car use will help to solve wider environmental problems like global warming						
Most people I know at university don't care how I travel to DMU						
I feel that I can contribute towards making my town / city a better place to live						
I think that most people who drive to DMU are, in principle, willing to reduce their car use						
I feel personal responsibility for helping to solve my town / city's traffic problems						
There should be limits on people's right to choose car travel to get to the university						
I can help to solve my town / city's environmental problems by avoiding car use						
My family and I are affected by pollution from cars						
My friends at DMU think that I shouldn't drive to get to university						
I feel morally obliged to avoid using the car to get to university						
Everyone should have the right to a free car park space at DMU						
I don't believe that environmental problems like global warming are caused by car use						
I believe that the university is sincere in trying to solve traffic problems						
Traffic problems can only be solved if everybody co-operates						
I feel a sense of moral obligation to minimise harm to the environment						

16 What are your views about particular transport measures? Please tick one box on each row to indicate whether you think each is good idea. (**Car pooling** involves a group of people having shared ownership of one or more vehicles. **Car sharing** involves people using their own vehicles to provide planned lifts for others.)

DMU...	Very bad idea	Bad idea	Neither good nor bad	Good idea	Very good idea	Unsure
Encouraging car pooling						
Introducing a car sharing scheme						
Introducing car park charges						
Introducing discounted public transport season tickets						
Introducing interest free loans for public transport season tickets						
Introducing more secure cycle sheds on campus						
Introducing more showers and changing facilities on campus						

17 Finally in this section, what are your views about the environment? Please tick one box on each row to indicate how much you agree or disagree.

	Disagree strongly	Disagree	Neither agree nor disagree	Agree	Agree strongly	Unsure
The so called 'ecological crisis' facing humankind has been greatly exaggerated						
The earth is like a spaceship with limited room and resources						
If things continue as they are, we will soon experience a major ecological catastrophe						
Nature is robust enough to cope with the impacts of modern industrialised nations						
Humans are severely abusing the environment						
I would describe myself as a 'green' person						

**Thank you. Now please continue to section 2.**

Please note that the question numbers in some subsequent sections do not follow on in sequence. This is because sections not relating to car users have been removed from this version of the questionnaire.

## Section 2. Questions specifically for car users

18 How many other people normally travel in your car on the way to DMU?

☐ None

☐ 2 others

☐ 1 other

☐ More than 2 others

19 Do you combine your journey with other trips, such as shopping, or dropping off children?

☐ Y ☐ N

20 How much do you spend on fuel each week?

☐ Less than £10

☐ £30 - £39.99

☐ £10 - £19.99

☐ £40 or more

☐ £20 - £29.99

☐ Unsure

21 Where do you park?

☐ Car park on campus

☐ Park and ride scheme

☐ Private car park nearby

☐ I am a passenger

☐ Street nearby

☐ Other arrangements

22 How easy is it to find a parking space?

	Very hard	Hard	Neither easy nor hard	Easy	Very easy
Finding a parking space is usually...					

23 Do you usually park in the same space each time you arrive at DMU? ☐ Y ☐ N

24 Is another mode of transport practical for you? ☐ Y ☐ N

25 Are you considering switching to another transport mode? ☐ Y ☐ N

26 What facilities would encourage you to switch? (Please tick no more than two.)

☐ Discounted public transport season tickets

☐ Spread payment scheme for public transport season tickets

☐ Secure cycle sheds on campus

☐ More convenient bus routes

☐ Bus between railway station and campus

☐ More showers and changing facilities on campus

☐ More cycle routes and footpaths

Other (please specify)



27 Would you take part in a car share scheme?

☐ Y ☐ N ☐ Unsure

28 What are the main issues affecting your willingness to take part in a car share scheme? (Please tick all that are important to you.)

☐ Security

☐ Awkward working hours

☐ Car already full

Other (please specify)

☐ Need for flexibility

29 What incentives would encourage you to car share? (Please tick two at most.)

☐ Guaranteed parking space

☐ Car park in good location

☐ Cheaper parking

Other (please specify)

☐ Potentially less congestion

☐ None of the above

30 Would you take part in a car pooling scheme?

☐ Y ☐ N ☐ Unsure

31 Please tick a box to indicate what you think about parking provision at your campus.

	Very bad	Bad	Neither good nor bad	Good	Very good
Current car parking facilities are...					

32 Please tick one box on each row to indicate how you feel about each of the following statements about your travel habits.

	Disagree strongly	Disagree	Neither agree nor disagree	Agree	Agree strongly	Unsure
It would be difficult for me to reduce my car use when getting to the university						
I am able to use forms of transport other than the car to get to the university						
I don't feel any personal responsibility for causing my town / city's traffic problems						
Other means of travelling to the university are available to me						
There are obstacles to me using any means other than the car when travelling to DMU						

33 Do you intend to change the amount that you use your car to travel to DMU during the next twelve months? Please tick one box to indicate your intentions.

☐ Increase      ☐ Stay the same      ☐ Reduce

If you ticked 'Stay the same', please go to question 36.

34 If you intend to change your level of car use when travelling to DMU in the next twelve months, please indicate why. (Please tick all that apply.)

☐ Flexibility concerns      ☐ Environmental concerns  
☐ Reliability concerns      ☐ Price / cost concerns  
☐ Personal safety concerns      ☐ Change of DMU site  
☐ Health or fitness      Other (please specify)   
☐ Personal circumstances

35 If you intend to change your level of car use when travelling to DMU during the next twelve months, please tick one box to indicate how much.

☐ Stop using my car altogether  
☐ Use another mode of transport 3 or 4 days each week  
☐ Use another mode of transport 1 or 2 days each week  
☐ Use another mode of transport 1 or 2 days each month  
☐ Use another mode of transport less than once a month  
☐ Increase use of the car

36 Below are some measures that DMU could encourage or introduce. How would each affect your willingness to reduce car use when travelling to the university?

The university...	Is likely to <b>put me off</b> reducing my car use	Would <b>have no impact</b> on my car use	Is likely to encourage me to <b>reduce my car use</b>
Encouraging car pooling			
Introducing a car sharing scheme			
Introducing car park charges			
Introducing discounted public transport season tickets			
Introducing interest free loans for public transport season tickets			
Introducing more secure cycle sheds on campus			
Introducing more showers and changing facilities on campus			

**Thank you. Now please continue to section 3.**

### Section 3. Business trips and study placements

61 How often do you make trips from your campus as part of your work or study?  
(If your answer is 'Never', please go to section 4.)

- |   |   |
|---|---|
| <input type="checkbox"/> More than once a day | <input type="checkbox"/> About once a month     |
| <input type="checkbox"/> Once a day           | <input type="checkbox"/> Less than once a month |
| <input type="checkbox"/> 2 or 3 times a week  | <input type="checkbox"/> Never                  |
| <input type="checkbox"/> About once a week    |   |

62 Where do you go? (Please tick all that apply.)

- ☐ Other DMU sites in the same town or city
- ☐ Other DMU sites in another town or city
- ☐ Other organisations in the same town or city
- ☐ Other organisations in another town or city

63 What distance is the most common journey that you make from your campus as part of your work or study?

- |   |  |
|---|--|
| <input type="checkbox"/> 0 - 2 miles    | <input type="checkbox"/> Over 10 miles |
| <input type="checkbox"/> 2.1 - 5 miles  | <input type="checkbox"/> Unsure        |
| <input type="checkbox"/> 5.1 - 10 miles |  |

64 Do any colleagues make the same trip on the same occasions?  
(If no, please go to question 66.)

☐ Y ☐ N

65 Do you travel together?

☐ Y ☐ N

66 What form of transport do you usually use for the main part of journeys from your campus as part of your work or study? (Please tick only one.)

- |   |                                      |
|---|--------------------------------------|
| <input type="checkbox"/> Hire car as driver       | <input type="checkbox"/> Train       |
| <input type="checkbox"/> Hire car as passenger    | <input type="checkbox"/> Bicycle     |
| <input type="checkbox"/> Private car as driver    | <input type="checkbox"/> Walk or run |
| <input type="checkbox"/> Private car as passenger | <input type="checkbox"/> Motorcycle  |
| <input type="checkbox"/> Taxi                     | <input type="checkbox"/> Other       |
| <input type="checkbox"/> Bus                      |                                      |

**Thank you. Please continue to section 4.**



## Section 4. Your travel options

67 Do you own a car? ☐ Y ☐ N

68 Do you have use of a car? ☐ Y ☐ N

69 Do you have a driver's licence? ☐ Y ☐ N

70 Do you own a bicycle? ☐ Y ☐ N

71 Do you know how to ride a bicycle? ☐ Y ☐ N

72 Is the area that you live in served by buses? ☐ Y ☐ N

73 Does the area you live in have a train service? ☐ Y ☐ N

74 Are you in any way disabled? (If no, please go to question 76.) ☐ Y ☐ N

75 Does your disability affect how you travel to and from DMU? ☐ Y ☐ N

76 Have you changed your usual form of transport to and from DMU during the last three years? (If no, please go to section 5.) ☐ Y ☐ N

77 How did you travel previously? (Please tick one box only.)

☐ Car as driver

☐ Bicycle

☐ Car as passenger

☐ Walk / Run

☐ Bus

☐ Motorcycle

☐ Train

Other (please specify)

78 Why did you change travel mode? (Please tick up to three.)

☐ Greater flexibility

☐ Personal circumstances

☐ Greater reliability

☐ Environmental concern

☐ Greater personal safety

☐ Price / cost

☐ Health or fitness

Other (please specify)

**Thank you. Please continue to section 5.**

## Section 5. The way forward

79 The university has, until now, met the full costs of running its car parks. In future, what do you think it should do? (Please tick one box only.)

- ☐ Continue to provide subsidised (free) car parking spaces
- ☐ Only subsidise sustainable forms of transport
- ☐ Provide no transport subsidies at all
- ☐ Subsidise all forms of transport equally
- ☐ Unsure

## Section 6. About you

This survey is anonymous and all responses will be treated as strictly confidential. This section is optional, but we would like to ask some questions about you, as the answers will help us to understand your opinions. We would be very grateful if you would provide the following details.

80 What is your home postcode?

81 Are you?

☐ Female

☐ Male

82 How old are you?

☐ Under 20

☐ 40-49

☐ 20-29

☐ 50-59

☐ 30-39

☐ 60 or over

83 Are you?

☐ Academic staff

☐ Undergraduate student

☐ Admin support staff

☐ Postgraduate student

☐ Other support staff

84 Are you?

☐ Full-time

☐ Part-time

85 What is your income (gross per year)?

☐ Under £10,000

☐ £30,000 - £39,999

☐ £10,000 - £19,999

☐ £40,000 or over

☐ £20,000 - £29,999

**Thank you very much for taking the time to help with this survey. Your answers will help to ensure that DMU can provide the facilities that staff and students need.**

If you would like to enter the free prize draw open to all survey respondents, please provide your details below.

Name   
Phone  E-mail

DMU is also seeking volunteers to keep a travel diary for a week, or to attend focus group sessions to explore possible travel policies. If you would like to take part, please tick the box and provide a contact phone number or e-mail address.

☐ I would like to take part in further research. You can contact me at  
Name   
Phone  E-mail

If you would like any more information about this initiative, please contact:

Sarah Wells  
DMU Transport Co-ordinator  
Bedford Tel 01234 793 121 E-mail [swells01@dmu.ac.uk](mailto:swells01@dmu.ac.uk)  
Leicester Tel 0116 257 7653

## **Appendix 2**

### ***Study 2 interview schedule***

---

Interview number	<input type="text"/>	Location	<input type="text"/>	Date	<input type="text"/>
Group	<input type="text"/>	Interviewee	<input type="text"/>		

---

## Section 1. Introduction

- Thank interviewee for attending.
- Introduce RW.
- Topic of research is travel behaviour. Current focus on travel to and from DMU.
- Part of PhD and also to assist Estates Department in developing DMU travel policies.
- Formalities:
  - Ask permission to tape interview
  - Assure confidentiality and no passing of information to other parties
  - Interviewee free to pull out at any time and without explanation
- Stress no right or wrong answers.
- Not many specific questions – more of an open-ended chat. Please follow train of thought wherever it takes you and expand on ideas as much as you can.
- Interviewee is expert – RW is trying to learn.
- Interview should take 30-40 mins.
- Interrupt at any time if questions seem irrelevant or unclear.
- Is there anything interviewee wants to ask before we go on?

## Section 2. Exploring motivations for travel mode choices

1. I'd like to start by asking about your journey to university this morning. What mode of transport did you use today?
2. Can you talk me through the decisions that led to you choosing [...] for today's journey?  
Probe – context issues such as weather, time, need to combine trips  
Is the decision over mode ever conscious, or always habitual?
3. What mode of transport do you usually use to get to DMU?
4. And why do you usually travel by [...]? Please tell me about anything at all that influences your choice.  
If predominantly contextual, probe personal issues – attitudes, SN, PBC, PN, AR, AC, affect, habit, status, role, environmental concern, etc.  
If predominantly personal, probe contextual issues – time, cost, flexibility, traffic  
If predominantly NAT, probe TPB and *vice versa*.
5. Can you tell me about any ways in which other people influence how you travel?  
If predominantly contextual, probe SN (injunctive and descriptive).  
If predominantly psychological, probe context – responsibilities to colleagues, children
6. Do you feel that your decisions about how to travel say anything about you as a person?  
Probe – role, status, values, priorities (time, cost)
7. I'd like to concentrate on driving now. First of all, can you tell me if there's anything that you particularly like or dislike about it?  
Probe – comfort, flexibility, privacy, speed, convenience, enjoyment, congestion, pollution, safety, comparison with other transport modes
8. Have you ever thought about reducing the amount that you use your car?
9. Can you tell me more about... why you considered reducing your car use / why reducing your car use isn't something that you've considered?  
If predominantly contextual, probe personal issues – attitudes, SN, PBC, PN, AR, AC, affect, habit, status, role, environmental concern  
If predominantly personal, probe contextual issues – time, cost, flexibility, traffic  
If predominantly NAT, probe TPB and *vice versa*.
10. According to Government figures, 61% of all journeys in the UK are made by car. Cars are obviously a very popular way of getting around. What do you think are the consequences of that – good or bad?  
Probe – safety, pollution, congestion, ease of access to facilities, AC local vs. AC global
11. With so many journeys being made by car, do you think that people should try to cut down on driving?  
Probe – social dilemma, obstacles to reducing, personal choice, AC, institutional vs. individual responsibility
12. Finally in this part of the interview, what do you think could be done to make it easier for people to use other modes of transport instead of their cars?  
Probe – public transport, cycling / walking facilities, employer initiatives, planning



Obligation to reduce	Responsibility for reducing	AC own driving	AC driving in general	Attitude to own driving	Attitude to reducing own driving	PBC for reducing
SN injunctive	SN descriptive	Habit	Affect	Status	Role beliefs	Env. concern
Social dilemma	Access to other modes	Responsibility to other people	Need for flexibility	Change of circumstances	Time constraints	Financial constraints

Thank you. I'd like to move on to something slightly different now – a short activity to help us to summarise the ideas that we've been talking about.

### Section 3. Prioritising influences on transport choices

I've got some blank post-it notes here. On each one, I'd like you to write down one thing that influences how you travel to DMU.

For example, you mentioned [use example from previous section of interview].

Just try to summarise each influence in a key word or phrase, don't worry about writing sentences.

Could you spend a couple of minutes doing that? Feel free to talk me through what you're writing as you do it.

When you're done, I'll just run through the things that you've mentioned so far in the interview to make sure that we haven't missed anything. But don't feel that you must include anything just because I mention it. These should be your ideas.

Now I'd like you to just put them in order of importance. Things that have a big influence on how you travel to DMU should go at the top, with less important influences at the bottom.

**STRESS:** Remember, there are no right or wrong answers, so please don't feel any pressure. We're just trying to summarise the ideas that we've already talked about.

#### Section 4. Knowledge of DMU travel initiatives

Now I just have some quick questions to finish with.

1. Firstly, have you ever heard of DMU's Green Travel Group?  
[If yes, ask questions 2 and 3. If no, go straight to question 4]
2. How did you hear about the Group?
3. From what you know about the Group, what do you think of it?
4. Are you aware of any measures that DMU has taken to encourage people to use their cars less for getting to university?  
[If yes, ask question 5. If no, move to next section]
5. What do you think of these measures?

#### Section 5. Close

That's the end of the interview. Thank you very much for your help.

Before I say goodbye, is there anything else that you'd like to add? Anything that you feel is relevant but that we haven't covered?

I'd like to ask if you'd be willing to fill in a very short questionnaire about the interview. It's just so that you can give your impressions of how it went, whether you felt able to say everything that you wanted to and so on. It should take ten minutes at most and I'll give you a stamped addressed envelope to send it back to me. Would that be OK?

[Ask the following question of each participant until eight have agreed to it.]

One last request. As I said at the start, I'll be writing a report on the research and I'd like to ask if you'd be willing to check a section of it before it's finalised, to ensure that it really reflects what participants have said. This is likely to happen towards the end of this year [2004]. Could you help with this?





## **Appendix 3**

### ***Study 2 post-interview questionnaire***

---

Interview number

Date

## DMU Travel Study post-interview questionnaire

Thank you very much for participating in a research interview. This questionnaire is part of the research quality control process. Your answers will help the researcher to ensure that the conclusions are justified by the information provided by participants.

1. How did you feel about participating in the interview *before* it took place?

---

---

---

2. How did you feel about having participated in the interview *after* it took place?

---

---

---

3. The researcher stressed that there were no right or wrong answers in the interview and asked you to talk freely. To what extent do you feel that you could do this?

---

---

---

4. Did anything in particular influence (enhance or constrain) the extent to which you felt able to talk freely?

---

---

---

5. Did you ever feel that you should answer questions in a particular way? If yes, please try to explain why.

---

---

---

6. What do you think the researcher was trying to achieve in the research?

---

---

---

7. Did your perceptions of the research aims influence the answers that you gave? If yes, please try to explain why.

---

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8. Finally, is there anything that you would like to add, including anything about your travel to DMU that you may have forgotten to say during your interview?

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***Thank you. Please return this questionnaire in the pre-paid envelope provided or by DMU internal mail if you are a member of staff.***

## **Appendix 4**

### ***Study 2 initial template***

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A priori themes are shown in black. New themes added during coding are shown in blue.

First-order theme	Theoretical definition	Second-order theme	Theoretical definition	Example operational definitions (interview, page, paragraph)
Personal norm for not driving (PN)	"[S]elf-expectations for specific action in particular situations... experienced as feelings of moral obligation" (Schwartz, 1977, 227).	Personal obligation <sub>(PN)</sub>	"[F]eelings of moral obligation" not to drive (Schwartz, 1977, 227).	"I feel morally obliged to, to sort of, um, hold my actions in check." (17, 6, 9)
		Guilt <sub>(PN)</sub>	"[T]he uncomfortable feeling of having done wrong" by driving ( <i>Oxford Dictionary of Philosophy</i> ).	"I used my car today... I wish I hadn't, but I did." (17, 1, 2-4)
Personal responsibility for not driving (AR)	"Socially, peoples' responsibilities are those things for which they are accountable" ( <i>Oxford Dictionary of Philosophy</i> ).			"It's down to the individual car owner, the responsibility." [For cutting down the amount of car use] (3, 7, 18)
Awareness of consequences of own driving (ACown)	A "tendency to become aware of the consequences of one's behavior for others" (Schwartz, 1977, 229).	Congestion <sub>(ACown)</sub>	Any reference to congestion caused by participant's own driving.	"I'm very aware that I cause congestion as much as the next driver." (19, 2, 15)
		Pollution <sub>(ACown)</sub>	Any reference to pollution caused by participant's own driving.	"It's, um, mostly the CO <sub>2</sub> it puts out." (18, 2, 18)
Awareness of consequences of driving generally (ACgen)	Awareness of the consequences of car use in general, rather than the participant talking about the consequences of their own car use specifically.	Congestion <sub>(ACgen)</sub>	Any reference to congestion caused by car use in general.	"Well obviously there's things like congestion." (20, 5, 5)
		Pollution <sub>(ACgen)</sub>	Any reference to pollution caused by car use in general.	"That's an awful lot of toxins and whatever else goes into the air because of cars." (10, 8, 18)
		Population health <sub>(ACgen)</sub>	Any reference to impacts of car use on people's health in general. NB. Not the participant's own health. This is covered by Personal health <sub>(ATT)</sub> .	"And with the levels of... children's health that are driven everywhere. They don't walk anywhere." (10, 9, 15)



Attitude toward one's own car use (ATT)	<p>"The degree to which a person has a favourable or unfavourable evaluation or appraisal of the behavior in question" (Ajzen, 1991a, 188). NB. Refers to the outcomes of the behaviour as performed by the participant; not by others.</p> <p>Participants may also mention their attitudes towards alternative modes. Inferences about their attitudes towards car use can often be drawn from such statements.</p>	Comfort <sub>(ATT)</sub>	Any reference to comfort of travelling by car or any reference to comfort of alternative modes that allows for inference about comfort of car.	"The last time I used a train... It was dirty. It was smelly. It was horrible." [The inference being that car is more comfortable] (20, 7, 7)
		Flexibility <sub>(ATT)</sub>	Any reference to flexibility of travelling by car or any reference to flexibility of alternative modes that allows for inference about flexibility of car. References to car allowing "independence" (in the sense that it enables people to do what they want, when they want) should be coded as Freedom.	"I'd do all sorts of other things. Making little sorts of detours and things, which I couldn't do on a bus. I mean if you get on a bus, you go from A to B and that's it." (19, 8, 14)
		Convenience <sub>(ATT)</sub>	Any reference to convenience of travelling by car or any reference to convenience of other modes that allows for inference about convenience of car. Also references to "practicality".	"It's an absolute convenience. Y'know, you get out of your office into your car and go home." (3, 5, 1)
		Speed <sub>(ATT)</sub>	Any reference to speed of travelling by car or any reference to speed of other modes that allows for inference about speed of car.	"I don't want to waste half an hour of my time sitting at the bus stop." [The inference being that driving does not waste time] (20, 6, 4)
		Personal safety <sub>(ATT)</sub>	Any reference to safety of travelling by car or any reference to safety of other modes that allows for inference about safety of car.	"I do not like cycling. I'm frankly scared of traffic. Wouldn't cycle, don't like it." [The inference being that driving is safer than cycling] (4, 3, 4)
		Reliability <sub>(ATT)</sub>	Any reference to reliability of car or to reliability of other modes that allows for inference about reliability of car.	"You know, it's... totally because you can't rely on the public transport system." (10, 11, 8)

		Personal health <sub>(ATT)</sub>	Any reference to health benefits or disbenefits of travelling by car or by other modes.	"Um, and my bicycle, I'd use that probably more for fitness." (17, 8, 10)
Perceived control over reducing own car use (PBC)	An overall evaluation of the perceived "ease or difficulty of performing" a behaviour (Ajzen, 1991a, 183).	Ease/difficulty <sub>(PBC)</sub>	Any reference to how easy or difficult a behaviour is or to factors that cause ease or difficulty.	"[T]here are issues around the facilities on the campus, which are, I feel are a barrier [to cycling] for me." (16, 1, 10)
		Volitional control <sub>(PBC)</sub>	"The extent to which people consider the performance of a behaviour to be under their voluntary control" (Trimafov <i>et. al.</i> , 2002, 101). Distinct from ease/difficulty because a behaviour may be under voluntary control, but still very difficult for social/cultural reasons.	"I have to drive. If I want to go anywhere, I have to drive." (20, 3, 15)
Subjective norm (SN)	"Perceived social pressure to perform or not to perform the behavior" (Ajzen, 1991a, 188).	Descriptive <sub>(SN)</sub>	Inferring "generally accepted standards of behaviour within a society, community, or group" from <i>observing</i> others' behaviour, not from considering <i>their wishes</i> regarding one's own behaviour ( <i>Oxford Dictionary of Psychology</i> ).	"I'd like to think that being around, the more people see people like me cycling or walking, I think people are more likely to do it themselves." [An example of participant exerting SN, rather than perceiving it] (1, 6, 15)
		Injunctive <sub>(SN)</sub>	"Perceived social pressure to perform or not to perform" an act (Ajzen, 1991a, 188). Perceptions of what others want one to do.	"The point I made about, you know, I don't have to work in Leicester, has been made to me by friends who are in the Green Party." (4, 4, 12)
Affect	"Emotion or subjectively experienced feeling, such as happiness, sadness, fear, or anger" ( <i>Oxford Dictionary of Psychology</i> ).	Privacy <sub>(Affect)</sub>	Any reference to enjoying (or not enjoying) driving because the driver has their own personal space.	"I think it's having your own personal space, really." [When asked why she enjoyed driving] (15, 4, 12)



		Enjoyment <sub>(Affect)</sub>	Any reference to enjoyment that does not rest on one of the other components of Affect.	"It's just a lovely, happy car to be in." (15, 6, 15)
		Skill <sub>(Affect)</sub>	Any reference to enjoying driving (or other modes) because of the skill involved.	"And in a way, if I stopped driving, I would feel that I'd kind of given up a skill." (4, 6, 7)
		Stress <sub>(Affect)</sub>	Any reference to stress or anxiety caused by any mode of transport (including stress caused by other road users).	"I hate driving. It gets me really worked up." (20, 3, 3)
		Control <sub>(Affect)</sub>	Any reference to enjoyment of a mode of transport on the basis of being in control of the vehicle.	"I've got control over the car. I can go fast. I can go slow." (19, 4, 18)
Right to drive	The idea that people see driving as a right: "a moral or legal entitlement to have or do something" ( <i>Oxford Concise Dictionary</i> ).			"I mean, don't get me started on parking spaces, but having a car is seen as like a human right." (6, 10, 4)
Willingness to endure inconvenience	Acceptance of some loss of personal utility on the basis of beliefs held by the individual. A willingness to sacrifice on the basis of one's values.			"There are times when... to have a car would be fantastic [but] I've tried to find other ways round it... I've bought a bike trailer and stuff." (6, 8, 5-7)
Confidence	"A belief and a self-assurance in one's own abilities" ( <i>Oxford Concise Dictionary</i> ).	Mode <sub>(Confidence)</sub>	Confidence in one's ability to use a particular transport mode.	"No problems. I used to cycle everywhere when I lived in London." [Reply when participant was asked how he felt about cycling] (8, 3, 11)
		Route <sub>(Confidence)</sub>	Confidence in travelling only on familiar routes.	"I like driving... routes I know." (10, 4, 10-12)
Status	"A person's subjective evaluation of his or her position in the status hierarchy" ( <i>Oxford Dictionary of Sociology</i> ).			"I mean, I wouldn't drive a Ferrari to show off, or whatever." (19, 4, 16)



				"It's everybody's ambition to be able to own a car and run it, for their personal convenience." (8, 10, 1)
Self-image	"The idea or conception that one has of oneself in general" ( <i>Oxford Dictionary of Psychology</i> ).			"I think you just wouldn't see me driving anything like that. Because it just says the wrong thing about how I feel I am." (15, 7, 11)
Habit	"A sequence of learned behaviour occurring in a particular context... They are often the result of conditioning, are performed automatically and unconsciously" ( <i>Oxford Medical Dictionary</i> ).			"Cos I always do." [Immediate answer to question of why participant drove to DMU on day of interview] (13, 1, 4)
Environmental values	An "assessment of something as good or bad in terms of one's standards or priorities" regarding the environment ( <i>Oxford Concise Dictionary</i> ). This theme captures any reference to environmental concerns that is not covered by AC, AR or PN.			"I guess the way that I've been brought up is to try and be as environmentally-friendly as I can." (17, 3, 3) "I try to save the planet by whatever means I can." (14, 3, 8)
Cynicism	The belief that "people [or organisations] are motivated purely by self-interest" ( <i>Oxford Concise Dictionary</i> ). Alternatively, scepticism about the truth of claims about environmental problems. NB. This is distinct from AC. It is not a lack of awareness of the consequences of car use. Rather, it is a view that these consequences are not as often claimed.	Government policy <sub>(Cyn)</sub>	Scepticism about the sincerity of government efforts to tackle transport problems.	"I personally think they're quite happy for everybody to use their cars 'cos they're generating quite a lot of money in tax out of it." (3, 8, 2)
		DMU policy <sub>(Cyn)</sub>	Scepticism about the sincerity of DMU efforts to tackle transport problems.	"When you think of the University, it's all kind of framework and little substance." (12, 25, 7)



		Impacts of car use <sub>(Cyn)</sub>	Scepticism about the truth of claims that car use harms the environment.	"I think carbon dioxide is the most innocent of substances that has been given an awfully bad press." (9, 15, 14)
Freedom	The belief that cars have improved quality of life by allowing people the freedom and opportunity to travel much more widely.			"The other thing, of course, is it opens up so much to you. You know, I can get to places that I just couldn't without a car." (19, 5, 11)
Knowledge of alternative modes	Knowledge of bus and/or train services or cycle/pedestrian routes that could be used instead of the car.			"I had thought, 'Oh, I could get the bus.' But I've forgotten. Completely forgotten where it goes." (11, 20, 4)
Cost	Any reference to the financial cost of travel, regardless of the mode of transport used. (Modes are differentiated by the second-order themes.)	Cost of driving <sub>(Cost)</sub>	Specific reference to the cost of driving.	"It's just part of my expenditure." [Response when asked whether she was worried by the cost of driving] (20, 6, 20)
		Paying twice <sub>(Cost)</sub>	Reference to travel mode choice being influenced by the fact that there are fixed costs for owning a car (e.g. tax, insurance) and so paying for public transport is viewed as a waste of money.	"The main reason I do it is because I own a car and I pay... insurance and everything... So because I have got a car, I think I might as well use the car." (4, 1, 6)
		Cost of alternatives <sub>(Cost)</sub>	Specific reference to the cost of alternatives to driving.	"To... catch a train from either Nottingham or Derby to London, that's forty-five pounds. Or about eighty pounds if you don't book in advance and just turn up on the day." (5, 11, 4)



Bicycle ownership	Whether participant owns a bicycle and whether this affects how they travel.			"I mean I'll walk, but I won't cycle. So, um, I'm not going to go awfully far really." (19, 5, 8)
Journey time	Whether journey time is mentioned as an influence on how participant travels.			"I suppose it is time actually. Because, um, it means I get to University quicker." (1, 2, 11)
Facilities for commuters	Any reference to facilities for those commuting to DMU, regardless of the mode of transport used.	Vehicle security <sup>(Facilities)</sup>	Concerns over the security of car/bike/motorbike while parked at DMU.	"There is sort of semi-security, but it's not, not really what you want for a fifteen-hundred pound bike." (16, 2, 6)
		Changing <sup>(Facilities)</sup>	Availability of changing rooms/showers for those who cycle or run to DMU.	"I would never have [run to work]... had there not been a shower." (14, 24, 8)
Journey distance	Reference to journey distance as an influence on how participant travels.			"Well it's great if you can do it... but I could not cycle fourteen miles a day." (20, 9, 14-16)
Combining trips	Reference to participant combining their commute with other journeys (e.g. shopping, visiting family).			"My mother lives in Leicester. I have to do her shopping once a week [on the way home from DMU], so we need the car for that." (3, 6, 3)
Weather	Reference to participant's travel mode choice being influenced by weather.			"I'd still cycle in the rain if it was light." (1, 13, 1)
Baggage	Reference to need to carry baggage or equipment as an influence on how participant travels.			"I can't take my laptop and all my other bits and pieces on my bike." (17, 1, 10)
Carriage of others in car	Whether participant gives lifts to others <i>en route</i> to and from DMU.			"I give a chap in our office a lift home." (3, 3, 18)

## **Appendix 5**

### ***Study 2 final template***

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A priori themes are shown in black. New themes added during coding are shown in blue.

First-order theme	Theoretical definition	Second-order theme	Theoretical definition	Example operational definitions (interview, page, paragraph)
Personal norm for minimising car use (PN)	"[S]elf-expectations for specific action in particular situations... experienced as feelings of moral obligation" (Schwartz, 1977, 227).	Personal obligation <sub>(PN)</sub>	"[F]eelings of moral obligation" not to drive (Schwartz, 1977, 227).	"I feel morally obliged to, to sort of, um, hold my actions in check." (17, 6, 9)
		Guilt <sub>(PN)</sub>	"[T]he uncomfortable feeling of having done wrong" by driving ( <i>Oxford Dictionary of Philosophy</i> ).	"I used my car today... I wish I hadn't, but I did." (17, 1, 2-4)
Personal responsibility for minimising car use (AR)	"Socially, peoples' responsibilities are those things for which they are accountable" ( <i>Oxford Dictionary of Philosophy</i> ).			"It's down to the individual car owner, the responsibility." [For cutting down the amount of car use] (3, 7, 18)
Awareness of consequences of own transport choices (ACown)	A "tendency to become aware of the consequences of one's behavior for others" (Schwartz, 1977, 229).	Congestion <sub>(ACown)</sub>	Any reference to congestion caused by participant's own travel.	"I'm very aware that I cause congestion as much as the next driver." (19, 2, 15)
		Pollution <sub>(ACown)</sub>	Any reference to pollution caused by participant's own travel.	"It's, um, mostly the CO <sub>2</sub> it puts out." (18, 2, 18)
		Resource use <sub>(ACown)</sub>	Reference to resources consumed by own travel (as opposed to pollution generated).	"I'm afraid we use an awful lot of petrol." (19, 3, 1)
		Road building <sub>(ACown)</sub>	Need to build/widen roads caused by own travel.	"The amount of, green belt, that's taken up by road building." (6, 8, 13)

Awareness of consequences of transport choices generally (ACgen)	Awareness of the consequences of transport choices in general, rather than the participant talking about the consequences of their own travel specifically.	Congestion <sub>(ACgen)</sub>	Any reference to congestion caused by travel in general.	"Well obviously there's things like congestion." (20, 5, 5)
		Pollution <sub>(ACgen)</sub>	Any reference to pollution caused by travel in general.	"That's an awful lot of toxins and whatever else goes into the air because of cars." (10, 8, 18)
		Road building <sub>(ACgen)</sub>	Need to build/widen roads caused by travel in general.	"The fact that we widen roads, create more roads." (4, 7, 12)
		Resource use <sub>(ACgen)</sub>	Reference to resources consumed by travel (as opposed to pollution generated).	"Presumably at some point there will be a limit to, you know, how much fuel there is available." (7, 16, 15)
		Accidents <sub>(ACgen)</sub>	Reference to accidents caused by car use.	"[T]here's road deaths." (1, 9, 17)
Attitude towards one's own car use for DMU commute (ATT)	"The degree to which a person has a favourable or unfavourable evaluation or appraisal of the behavior in question" (Ajzen, 1991a, 188). NB. Refers to the outcomes of the behaviour as performed by the participant, not by others.	Comfort <sub>(ATT)</sub>	Any reference to comfort of travelling by car.	"The last time I used a train... It was dirty. It was smelly. It was horrible." [The inference being that car is more comfortable] (20, 7, 7)
		Flexibility <sub>(ATT)</sub>	Any reference to flexibility of travelling by car for specific journeys. References to car allowing "independence" more generally (in the sense that it enables people to do what they want, when they want) should be coded as Freedom.	"I'd do all sorts of other things. Making little sorts of detours and things, which I couldn't do on a bus. I mean if you get on a bus, you go from A to B and that's it." (19, 8, 14)



		Convenience <sub>(ATT)</sub>	Any reference to convenience of travelling by car. Also references to "practicality".	"It's an absolute convenience. Y'know, you get out of your office into your car and go home." (3, 5, 1)
		Speed <sub>(ATT)</sub>	Any reference to speed of travelling by car.	"I don't want to waste half an hour of my time sitting at the bus stop." (20, 6, 4)
		Personal safety <sub>(ATT)</sub>	Any reference to safety of travelling by car.	"I do not like cycling. I'm frankly scared of traffic. Wouldn't cycle, don't like it." [Inference being that driving is safer than cycling] (4, 3, 4)
		Reliability <sub>(ATT)</sub>	Any reference to reliability of car.	"You know, it's... totally because you can't rely on the public transport system." (10, 11, 8)
		Controllability <sub>(ATT)</sub>	Any reference to being in control of one's journey. This is distinct from flexibility, which is a matter of being able to travel when one wants to.	"To be in control of time. Because alternatives are uncertain." (14, 22, 1)
Attitude to using other modes for DMU commute (ATT-OM)	"The degree to which a person has a favourable or unfavourable evaluation or appraisal of the behavior in question" (Ajzen, 1991a, 188). NB. Refers to the outcomes of the behaviour as performed by the participant, not by others.	Comfort <sub>(ATT-OM)</sub>	Any reference to comfort of travelling by modes other than car.	"The last time I used a train... It was dirty. It was smelly. It was horrible." (20, 7, 7)
		Flexibility <sub>(ATT-OM)</sub>	Any reference to flexibility of travelling by modes other than car. References to "independence" should be coded as Flexibility.	"I'd do all sorts of other things. Making little sorts of detours and things, which I couldn't do on a bus. I mean if you get on a bus, you go from A to B and that's it." (19, 8, 14)



	A sequence of learned behaviour occurring in a particular context... They are often the result of conditioning, are performed automatically and... (Oxford Concise Dictionary)	Convenience <sub>(ATT-OM)</sub>	Any reference to convenience of travelling by modes other than car. Also references to "practicality".	"[T]he bus just picks me up from the end of my road, literally... So that's quite convenient." (13, 2, 6-10)
		Speed <sub>(ATT-OM)</sub>	Any reference to speed of travelling by modes other than car.	"I don't want to waste half an hour of my time sitting at the bus stop." (20, 6, 4)
		Personal safety <sub>(ATT-OM)</sub>	Any reference to safety of travelling by modes other than car.	"The safety issue is an important aspect. For women in particular... that would apply on public transport, on a train late at night." (7, 17, 7)
		Reliability <sub>(ATT-OM)</sub>	Any reference to reliability of modes other than car.	"You know, it's... totally because you can't rely on the public transport system." (10, 11, 8)
		Personal health <sub>(ATT-OM)</sub>	Any reference to health benefits or disbenefits of travelling by modes other than car.	"Um, and my bicycle, I'd use that probably more for fitness." (17, 8, 10)
		Controllability <sub>(ATT-OM)</sub>	Any reference to being in control of one's journey. This is distinct from flexibility, which is more a matter of being able to travel when one wants to.	"You know it's gonna take you however long to get in and unless you have a puncture or anything you're not gonna get caught up in traffic." (17, 2, 10)
Perceived control over reducing own commuter car use (PBC)	An overall evaluation of the perceived "ease or difficulty of performing" a behaviour (Ajzen, 1991a, 183).	Difficulty <sub>(PBC)</sub>	Any reference to how easy or difficult a behaviour is or to factors that cause ease or difficulty.	"[T]here are issues around the facilities on the campus, which... are a barrier [to cycling] for me" (16, 1, 10)



		Volitional control <sub>(PBC)</sub>	"The extent to which people consider the performance of a behaviour to be under their voluntary control" (Trimafo <i>et. al.</i> , 2002, 101). Distinct from ease/difficulty because behaviour may be under voluntary control, but still very difficult for social/cultural reasons.	"I have to drive. If I want to go anywhere, I have to drive." (20, 3, 15)
Affect	"Emotion or subjectively experienced feeling, such as happiness, sadness, fear, or anger" ( <i>Oxford Dictionary of Psychology</i> ).	Privacy <sub>(Affect)</sub>	Any reference to enjoying (or disliking) driving because the driver has their own personal space.	"I think it's having your own personal space, really." [When asked why she liked driving] (15, 4, 12)
		Enjoyment <sub>(Affect)</sub>	Any reference to enjoyment that does not rest on one of the other components of Affect.	"It's just a lovely, happy car to be in." (15, 6, 15)
		Skill <sub>(Affect)</sub>	Any reference to enjoying driving (or other modes) because of the skill involved.	"And in a way, if I stopped driving, I would feel that I'd kind of given up a skill." (4, 6, 7)
		Stress <sub>(Affect)</sub>	Any reference to stress or anxiety caused by travel (including stress caused by other road users).	"I hate driving. It gets me really worked up." (20, 3, 3)
		Control <sub>(Affect)</sub>	Any reference to enjoyment of a mode of transport on basis of being in control.	"I've got control over the car. I can go fast. I can go slow." (19, 4, 18)
Confidence	"A belief and a self-assurance in one's own abilities" ( <i>Oxford Concise Dictionary</i> ).	Mode <sub>(Confidence)</sub>	Confidence in one's ability to use a particular transport mode.	"No problems. I used to cycle everywhere when I lived in London." [Reply when participant was asked how he felt about cycling] (8, 3, 11)



Habit	"A sequence of learned behaviour occurring in a particular context... They are often the result of conditioning, are performed automatically and unconsciously" ( <i>Oxford Medical Dictionary</i> ).			"Cos I always do." [Immediate answer to question of why participant drove to DMU on day of interview] (13, 1, 4)
Laziness	Whether modal choice is influenced by laziness.			[Car use] "expends less energy on your part as well." (13, 7, 9)
Environmental values	An "assessment of something as good or bad in terms of one's standards or priorities" regarding the environment ( <i>Oxford Concise Dictionary</i> ). This theme captures any reference to environmental concerns that is not covered by AC, AR or PN.			"I guess the way that I've been brought up is to try and be as environmentally friendly as I can." (17, 3, 3) "I try to save the planet by whatever means I can." (14, 3, 8)
Social values	In accordance with the above definition: the view that societal well-being is good.			"I would hope that my action sort of contributes to a broader, better whole." (1, 6, 7)
Tiredness	Whether tiredness affects the participants' choice of travel mode			"That's depending on how tired I am as well. That's a key factor." (16, 4, 2)
Cynicism	The belief that "people [or organisations] are motivated purely by self-interest" ( <i>Oxford Concise Dictionary</i> ). Alternatively, scepticism about the truth of claims about environmental problems. NB. This is distinct from AC. It is not a lack of awareness of the consequences of car use. Rather, it is a view that these consequences are not as often claimed.	Cynicism <sub>(DMU)</sub>	Scepticism about the sincerity of DMU efforts to tackle transport problems.	"When you think of the University, it's all kind of framework and little substance." (12, 25, 7)
		Cynicism <sub>(Env)</sub>	Scepticism about the truth of claims that car use harms the environment.	"I think carbon dioxide is the most innocent of substances that has been given an awfully bad press." (9, 15, 14)



Cost	Any reference to the financial cost of travel, regardless of the mode of transport used. (Modes are differentiated by the second-order themes.)	Cost of driving <sub>(Cost)</sub>	Specific reference to the cost of driving.	"It's just part of my expenditure." [Response when asked whether she's worried by the cost of driving] (20, 6, 20)
		Paying twice <sub>(Cost)</sub>	Reference to travel mode choice being influenced by the fact that there are fixed costs for owning a car, so paying for public transport is a waste of money.	"And two of us buying the season rail ticket, but you've still gotta have the car anyway... you've still gotta pay the road tax." (3, 2, 15)
		Cost of alternatives <sub>(Cost)</sub>	Specific reference to the cost of alternatives to driving.	"To... catch a train from either Nottingham or Derby to London, that's forty-five pounds. Or about eighty pounds if you don't book in advance and just turn up on the day." (5, 11, 4)
		Fixed costs <sub>(Cost)</sub>	Reference to travel mode choice being influenced by the fact that there are fixed costs for owning a car, but without reference to having to pay additional fares for public transport.	"The main reason I do it is because I own a car and I pay... insurance and everything... So because I have got a car, I think I might as well use the car." (4, 1, 6)
Bicycle ownership	Whether participant owns a bicycle and whether this affects how they travel.			"I mean I'll walk, but I won't cycle. So, um, I'm not going to go awfully far really." (19, 5, 8)



Journey time	Whether journey time is mentioned as an influence on how participant travels.			"I suppose it is time actually. Because, um, it means I get to University quicker." (1, 2, 11)
Car ownership	Whether participant owns a car and whether this affects how they travel. NB. Participant may own a car because they need it for non-DMU journeys but fact that they own it leads them to use it for DMU travel too.			"There's certain things that I do... that I think would be difficult without my car... so I choose to have a car for that sort of convenience." (4, 2, 3)
Train availability	Participant's perception of whether there is a train service suitable for commute.			"There is a train stop, but it either gets me to work late or gets me to work, er, y'know, two hours early." (3, 1, 6)
Bus availability	Participant's perception of whether there is a bus service suitable for commute.			"There is no bus service from the village where I live." (3, 1, 6)
Car availability	If participant has a car but it is temporarily unavailable, forcing change of mode.			"I have used buses on a couple of occasions. When I've not had the car for various reasons. When it's been for MOT or whatever." (13, 1, 18)
Facilities	Any reference to facilities for those commuting to DMU, regardless of the mode of transport used.	Security(Facilities)	Concerns over the security of car/bike/motorbike while parked at DMU.	"There is sort of semi-security, but it's not, not really what you want for a fifteen-hundred pound bike." (16, 2, 6)
		Changing(Facilities)	Availability of changing rooms/showers for those who cycle or run to DMU.	"I would never have [run to work]... had there not been a shower." (14, 24, 8)



		Parking <sub>(Facilities)</sub>	Availability of parking space at DMU as an influence on modal choice.	"I used to travel in by bus 'cos I didn't have a car parking space." (7, 1, 5)
		Park and ride <sub>(Facilities)</sub>	Availability (or lack of) park and ride as an influence on modal choice.	"Or a park and ride... so you could [park there and] choose whether you got the bus or walked." (7, 7, 17)
Journey distance	Reference to journey distance as an influence on how participant travels.			"Well it's great if you can do it... but I could not cycle fourteen miles a day." (20, 9, 14-16)
Combining trips	Reference to participant combining their commute with other journeys (e.g. shopping, visiting family).			"My mother lives in Leicester. I have to do her shopping once a week [on the way home from DMU], so we need the car for that." (3, 6, 3)
Socialising	Reference to participant not travelling by car because they are going straight to a social event after work.			"Oh, I was going to the theatre. That was why I didn't bring the other one [car] in." (7, 9, 14)
Weather	Reference to participant's travel mode choice being influenced by weather.			"I'd still cycle in the rain if it was light." (1, 13, 1)
Baggage	Reference to need to carry baggage or equipment as an influence on how participant travels.			"I can't take my laptop and all my other bits and pieces on my bike." (17, 1, 10)
Novelty	If participant switches modes 'just for a change'.			"I'm sure I've done it on a few occasions, when I've just got the bus for a change." (13, 10, 7)



Lift availability	Whether participant has the option of getting a lift to and from DMU and whether this influences modal choice.			"[I]f she goes home in the evening or something, then I can... get a lift. That would influence what I do." (6, 3, 17)
Job	Whether participant has job requirements (e.g. needing smart clothes) that influence modal choice.	Job <sub>(Dress)</sub>	Requirement to wear a particular style of dress during the working day as an influence on modal choice.	"Sometimes I need smart dress for meetings during the day, so I can't really cycle." (22, 1, 2)
		Job <sub>(Drive)</sub>	Requirement to drive for work during the working day.	"This morning I chose the car for a couple of reasons. I had to bring some stuff in and I might be moving some stuff around during the day." (5, 1, 6)
		Job <sub>(Parking)</sub>	Requirement to drive because employer demands retention of parking spaces.	"Er, and in order to retain hold of certain quality parking spaces, if you like, they said you must have a parking space." (8, 1, 6)
Season	Whether the season of the year affects travel mode choice.			"Over winter I walk... but in the summer, I have started to think 'Oh, it's light enough to cycle'." (1, 1, 2)